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THE ECONOMIC ASPECT OF TOP-DRESSING.

Investigational Trial in the Midlands.

By R. H. BEVIN, Dip. C.A.C., B.Agr., District Agricultural Organiser.

IT is generally conceded that top-dressing of artificial pastures consisting of mixed grass and clovers, growing in regions of 20 inches rainfall and over, is a payable proposition on the majority of Tasmanian soils. The widespread use of fertilisers for this purpose by the more progressive section of the farming community indicates that the practice is justified.

Up to the present little data is available as to whether the outlay of capital on fertilisers is warranted on native grass on such country as the Midlands, where the rainfall is under 20 inches, and where there is such a great scope of country carrying *Danthonia* and Kangaroo grass with suckling and clustered clovers in the bottom. Few farmers who have been top-dressing have kept strict records of the stock carried over a number of years on any given area, and it is therefore impossible to make any definite statement as to profit when native grass is top-dressed under Midland conditions.

Because of the area of land involved, it was therefore considered advisable to carry out an investigation in order that a measurement of the improvement brought about by the application of superphosphate could be obtained.

For the purpose of such an investigation a number of conditions had to be fulfilled before any particular area could be regarded as suitable:—

1. Duration of the Trial.—It was decided that a five-year trial be initiated, so that a variety of seasons would be experienced, and any abnormal results from a particularly favourable or unfavourable season would be neutralised.
2. In order to place the scheme on a practicable basis, fairly large plots, which would be capable of carrying a considerable number of stock, were essential. The area finally decided on was 6 acres for each plot.
3. It was also essential that permanent water should be available in each plot.
4. Average soil of the better class was selected, as on such it is hoped to get definite increases, which would then provide a guide to the possibilities of payable improvement on poorer soils.

5. Location.—The area, to be of demonstrational value, had to be located on the main road, so that it would be readily accessible to those interested.
6. Finally it was essential that sympathy with the project, and co-operation in its execution, should be forthcoming from the owner of the land on which the trial was located.

The Department has been fortunate in finding a combination of all the above conditions on the property of Mr. George Keach, "Chiswick," and it was decided to establish there the area now known as the "Ross Plots."

Early in 1929 steps were taken to go ahead with the work, and the sympathy of a number of firms who were keenly interested in the trial was enlisted. The Electrolytic Zinc Company generously offered to assist with the financial side, while donations of fencing material were made by the Cyclone Fence and Gate Company, the Titan Wire Company, and the B.H.P. Limited. Mr. George Keach placed 42 acres at our disposal, with the assurance that he would assist to advance the undertaking.

The fencing of the various plots was proceeded with, and in order to add interest to the demonstration a variety of different types of woven-wire fencing and gates was used. Stiles were also erected to facilitate inspection by visitors. A supply of permanent water was assured by erecting small dams across the creek, these dams acting at the same time as bridges for the passage of stock. Each plot is provided with a shelter for sheep, and the number of each plot is prominently placed for reference when one is going over the area. A box containing an "information" leaflet is placed on the gate-post of Plot 2, and with it has been recently placed a visitors' book.

General Description of the Plots.

The Ross plot area consists of seven 6-acre paddocks, situated 1½ miles north of Ross township, on the east side of the main Hobart-road. The dividing fences run north and south, parallel to the road, and the plots are numbered from the road fence.

There are five plots subject to various treatments, and two "controls," which are not treated in any way, but for purposes of comparison will remain in their native state throughout the trial. For the two control plots, No. 2, which was considered the poorest, and No. 6, which was the best, were selected:—

The details of treatment being followed are:—

No. 1. One hundredweight superphosphate each year.
No. 2. Control.
No. 3. Two hundredweights superphosphate each year.
No. 4. One and a half hundredweight superphosphate each year.

No. 5. Green crop in spring, 1929; sown in permanent mixed grasses in autumn, 1930; 1 cwt. superphosphate each year.

No. 6. Control.

No. 7. Scarified with spring-tooth cultivator in autumn, 1929, and sown with 4 lb. Subterranean Clover. 1 cwt. of superphosphate each year.

On this plot the clover did not strike, and a further sowing of 3 lb. was made in autumn, 1930, with 6 lb. Wimmera Ryegrass.

All plots except the controls are harrowed in late autumn.

STOCKING AND RECORDING.

The system laid down for stock-recording on the plots consists of putting on as many stock as each will reasonably carry, in order to keep the grass short and fresh, varying the number as the quantity of feed increases or diminishes. As stock are added or withdrawn their number and description are recorded in a "stock record book." From this record the "sheep days" per acre can be calculated. For this purpose one cattle beast is taken as equivalent to six sheep, and two lambs equal to one sheep. This is done by Mr. George Keach, without whose co-operation it would be impossible to carry the work to a successful conclusion.

Stocking was commenced on 4th July, 1929, and will be continued until the termination of the trial. Last summer the growth of native grass got somewhat ahead of the stock, and burning-off of the roughage was carried out. This will be avoided in future years by heavier stocking at the critical period of growth, and based on last season's experience.

The "stock day" method of measuring the increase brought about by top-dressing is admittedly not entirely accurate, as it takes no account of the improvement in health and vigour of the stock or of the improvement, in the case of sheep, in the wool-clip. Nevertheless it provides a sound method of comparison between the various plots, and, with the means at our disposal, is the best which could be used for this purpose.

GENERAL POINTS OF INTEREST UP TO DATE.

As mentioned previously, no conclusions can be drawn from one season's working, but an inspection of the plots reveals several developments, particularly in regard to the herbage on the various plots. Where super. has been applied the growth is much earlier than on the controls; there is an increased amount of clover, especially on the banks, and the turf generally is thickening up under the top-dressing treatment. Where surface cultivation was carried out the invigorating effect on English ryegrass on the flats is most noticeable. With the heavier stocking in the treated areas, the cumulative effect on fertility of dunging and trampling should be well worth noting, as this is one of the major features of improvement where manurial dressings are applied to grass land.

FURTHER WORK.

At the completion of the five years it may be desirable to carry on the work with no further manurial applications, in order to get some measure of the residual effect of top-dressing. This aspect of the practice has received little attention in the past, and the records over a further period should prove quite as interesting as those at present being compiled.

FIELD DAYS.

A field day held on 23rd November, 1929, attracted over 100 farmers and graziers from different parts of the State, and throughout the year numerous visitors have inspected the plots.

The carrying on different plots for the period 12th October, 1930, to 9th December, 1930, was:—

	Stock Days.
Plot 1	1293
Plot 2	967·5
Plot 3	3253·5
Plot 4	2079
Plot 5	1336·5
Plot 6	448·5
Plot 7	2001

The average of control plots 2 and 6 is 708 stock days.

On treated plots the increase for this period over control average is:—

	Per Cent.
No. 1 plot	83
No. 3 plot	369
No. 4 plot	194
No. 5 plot	89
No. 7 plot	183

Owing to accidental movement of stock the reliability of previous records has been somewhat upset, and they have, in consequence, been discarded.

ACKNOWLEDGMENTS.

The Department wishes to acknowledge its indebtedness to the following firms, which have contributed so largely to the successful establishment of the trial:—

The Electrolytic Zinc Company.
Cyclone Fence and Gate Company.
Titan Wire Company.
Rylands Bros. (Australia) Limited.

Also to Mr. George Keach, who generously provided the area. Mr. Keach's co-operation in managing the stocking and compiling the stock records of the trial is invaluable, as without such help the work would be impossible.

APPLE STORAGE EXPERIMENTS.

By P. H. THOMAS, Chief Horticulturist, and T. D. RAPHAEL, B.A., Dip. Hort., Horticulturist.

DURING recent years the importance of picking maturity in relation to the storage and keeping qualities of apples has been recognised by both producers and exporters. In order to obtain more complete information on this subject, a series of apple storage trials was carried out by the Horticultural Division in co-operation with the Council for Scientific and Industrial Research. During the past two years facts have been brought to light which are of direct interest to Tasmanian orchardists, and a brief discussion here of the work carried out up to the present time may be of interest.

In 1929 fruit for this experiment was obtained from an area of bearing orchard near Huonville, certain varieties of which were known to be particularly susceptible to bitter pit in some years. In 1930, however, a less susceptible area was chosen, the fruit necessary for the experiment being obtained from an orchard at the Grove.

In each instance great care was taken to select comparable trees as regards vigour, crop, and soil, and in harvesting. Equal quantities of fruit were taken from each tree so that the individual tree factor might be eliminated as far as possible. During the coming season it is proposed to continue the experiment with fruit from both areas.

PROCEDURE.

The first method adopted was to make weekly pickings of the varieties Cleopatra and Cox's Orange Pippin, commencing towards the end of February at the green immature stage and continuing until about mid-April, by which time the fruit was yellow and fully ripe. On each occasion the fruit was picked and cold stored without delay.

In the second method three pickings only were made at well-defined periods of maturity, gauged by—

(*a*) The iodine maturity test.
(*b*) The U.S.A. Colour Chart.

Three cases of each variety were selected at each picking, one case being stored immediately, and the remaining two cold stored at intervals of 7 and 14 days after picking.

As many fruitgrowers are not familiar with these methods of testing maturity, a brief explanation may not be out of place:

(*a*) *The Iodine Test for Maturity.*—This method of testing the maturity of apples for picking has already proved fairly reliable in Western Australia and elsewhere, and a few of the essential points will be of interest.

As the apple ripens the starch in the fruit is gradually replaced by sugars. A measure of this process can be obtained by cutting the apple across the centre and testing the exposed surface of the flesh with a solution made up of 10 grains of potassium iodine and 2·5 grains of iodine per litre. Unripe apples, that

is, those in which the carbohydrates are stored in the form of starch, turn a dark grey to black colour. When an apple is absolutely ripe no change in the colour of the cross-section of the flesh takes place, showing that practically no starch is present, it having been converted to sugars. As the apple ripens this change first occurs round the core, and later extends to the cortex or outside flesh, so that all intermediates between a perfectly black (immature) cross-section to a natural flesh colour (ripe) can be obtained. The accompanying illustrations show the various stages in ripening.

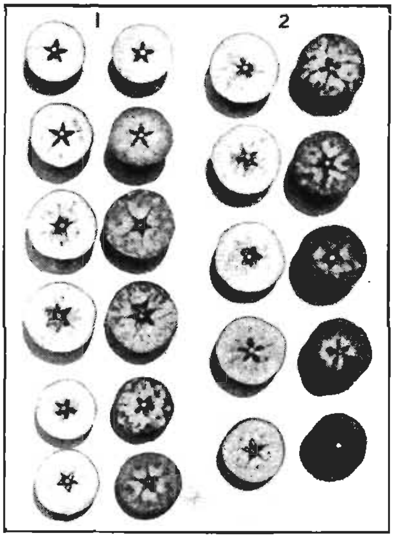


PLATE I.—IODINE TEST APPLIED TO 11 VARIETIES OF APPLES ON 1 APRIL, 1929.

The untreated halves are on the left. The following are varieties represented:—

1.	2.
Worcester Pearmain.	Scarlet.
Esopus Spitzenburg.	Cox's Orange Pippin.
Jonathan	Crofton Pearmain
Adams Pearmain	Cleopatra
Pomme de Neige	Delicious.
	Sturmer Pippin.

A graduation in maturity can be traced down through the varieties from Worcester, an early variety, to Sturmer Pippin, one of the late maturing kinds.

(*b*) *The Colour Chart Test* consists of merely matching the green of the unflushed side of the apple with the colours on the chart issued. Usually four shades, ranging from a deep green (No. 1 stage) to a light yellow (No. 4 stage), are adopted as a basis. Thus No. 1 indicates the unchanged immature fruit and No. 4 the fully mature apple ready for immediate use.

After a period of ten weeks' cold storage, all the fruit was examined and details were taken of the loss caused by the various

storage diseases. A second examination was made after a further two weeks at ordinary atmospheric temperatures. The final results appear in the appended tables.

DISEASES OCCURRING.

The most serious diseases experienced were bitter pit and internal breakdown, though there was a small percentage loss through fungal rots and skin scald. Most growers are familiar with the diseases mentioned, but lest the names are confusing a short description follows:—

(*a*) *Bitter Pit.*—This disease appears as small, sunken, slightly discoloured areas generally occurring around the calyx end of the fruit. If the skin is removed, characteristic pits of dry brownish tissue are visible in the flesh. The true form of

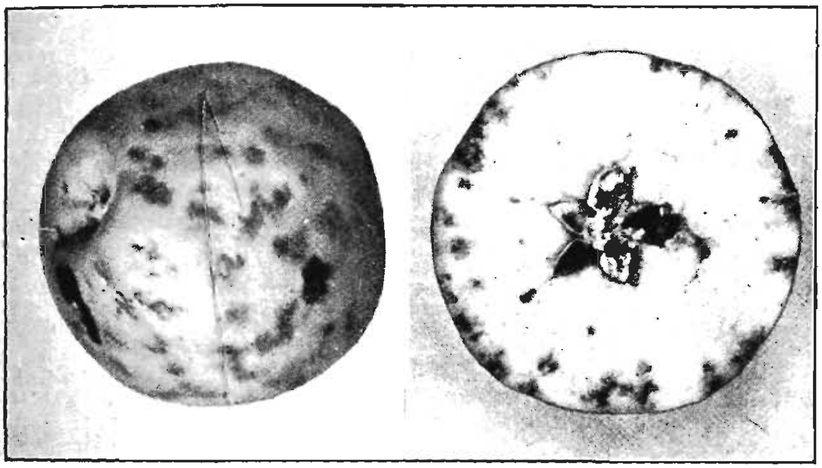


PLATE II.—CLEOPATRA APPLE AFFECTED WITH BITTER PIT AND THE INTERNAL APPEARANCE OF THE DISEASE IN THE SAME FRUIT.

bitter pit only develops in storage, but frequently "cork," which appears when the fruit is still on the tree is misnamed "bitter pit." The definite cause of the disease has not yet been ascertained, but the growth of the fruit and water relations of the tree during the season have a marked bearing on its development. Immature fruit, when stored, generally suffers considerable injury from this trouble.

(*b*) *Internal Breakdown.*—This condition is also known as "flesh collapse," and is due either to a state of over-ripeness or unsuitable temperature conditions in storage. The affected fruit generally feels spongy to the hand, and, on cutting, the outer areas of the flesh are mealy in texture and discoloured. Certain types of breakdown in harder varieties may sometimes show a brown flesh colour, unaccompanied by any softening.

(*c*) *Fungal Rots.*—A number of fungi are associated with various forms of apple rots, the commonest found in the experimental fruit being the soft wet rots caused by *Penicillium expan-*

sum. A few rots caused by *Botrytis cinerea* also occurred; these are light-brown in colour and comparatively firm. A number of apples affected with lenticel rots were found in both seasons; some of these were caused by the fungus *Sporotrichum malorum,* as many as 10 or 12 small rotted spots often appearing on the skin of the apple. The damage, however, was confined to one or two cases of fruit.

(*d*) *Scald.*—This disease is characterised by brown patches on the skin of the fruit, which may eventually spread to cover the whole surface. Immature fruit appears to be most susceptible, and higher temperatures favour its development. This is supported by the occurrence of the disease this season only in the earliest picking of the Cox's Orange Pippin and Ribston Pippin, which had been held at atmospheric temperatures 14 days previous to cold storage. Oiled wrapping papers have proved useful in the control of this form of disease.

RESULTS.

The following tables briefly give the results obtained for the three varieties under consideration, viz., Cleopatra, Cox's Orange Pippin, and Ribston Pippin, during the past two seasons:—

Cleopatra.

1929.					1930.				
Picking Date	B.P. %	I.B. %	R. %	Total Loss. %	Picking Date	B.P. %	I.B. %	R. %	Total Loss. %
25.2.29..	58	0	0	58	26.2.30..	5	0	0	5
11.3.29..	54	0	0	54	12.3.30..	2·7	0	0	2·7
26.3.29..	46·5	0	0	46·5	26.3.30..	·6	0	1·3	1·9
15.4.29..	32·3	0	0	32·3					

B.P. = Bitter Pit.
I.B. = Internal Breakdown.
R. = Rots.

Ribston Pippin.

—	—	—	—	—	26.2.30..	1·5	0	0	1·5
—	—	—	—	—	12.3.30..	17·4	3·8	·8	22
—	—	—	—	—	26.3.30..	4·5	16·6	1·3	22·4

B.P. = Bitter Pit.
I.B. = Internal Breakdown.
R. = Rots.

Cox's Orange Pippin.

4.3.29..	61·4	12·5	·8	74·7	26.2.30..	2·3	0	0	2·3
18.3.29..	15	39	0	54	12.3.30..	5·7	·5	·5	6·7
3.4.29..	5·2	50·3	0	55·5	26.3.30..	1·5	1	·5	3

B.P. = Bitter Pit.
I.B. = Internal Breakdown.
R. = Rots.

Bitter Pit.—The most marked feature in the table of results is the pronounced contrast between the occurrence of bitter pit in the two years under consideration. The low incidence of pit in 1930 is probably related to the dry summer and large crop, such conditions producing slower growth and more regular ripening, factors which have been found to considerably influence bitter pit development. Confirmatory evidence in regard to this was obtained by the Council for Scientific and Industrial Research this season with Cleopatra. Certain trees growing under semi-arid conditions had small fruits, and were irrigated in the third week of February. When picked in the middle of March the fruits from these trees suffered much more from bitter pit than fruits from the remaining trees in the same orchard.

In 1929 a very clear and distinct relationship was evident between the time of picking and the development of bitter pit in storage. With Cox's Orange Pippin the percentage of pit varied from 61 per cent. at the early immature picking in early March to 5 per cent. in those harvested a month later. Cleopatra showed a similar, though less marked, tendency. The 1930 results show practically no variation between the pickings, except, perhaps, in Ribstons. Examinations of the pickings from this variety showed that only Nos. 2 and 3 contained fruits comparable in size, and, if No. 1 picking is omitted, the tendency noted in 1929 is evident. A factor which may account for the small amount of pit in Ribstons of the first picking last season is that, in accordance with observations of the Council for Scientific and Industrial Research, bitter pit commences with maturation, increases, and then declines to a low level in the mature fruit.

Up to the present it has not been possible to study the effect of varying storage temperatures on the development of bitter pit, but it is hoped to start work on this question in the coming season, when two complete series of cases, treated as last year, will be held at different temperatures. Work on the temperature aspect in other parts of the world has produced very variable results, which would indicate that optimum storage temperatures from the bitter pit aspect will differ with the variety and, probably, environmental factors also.

Internal Breakdown.—Considerable loss from this disease occurred in both seasons, though very little was found at the first examination after coming out of cool store.

An examination of the tables relating to internal breakdown will show that the most extensive loss took place, amongst the later pickings, quite the reverse to the occurrence of bitter pit. This would seem to show that the breakdown was largely of the over-ripe type, though this tendency was not constant throughout, and the cold storage type of breakdown appears to have influenced results in some instances.

In harvesting such varieties as Cox's Orange Pippin and Ribston Pippin, which are subject to both bitter pit and internal breakdown, it appears to be difficult to select the optimum picking period which will give a fruit mature enough to avoid bitter pit yet sufficiently firm to hold up for a few weeks after storage, and so eliminate loss from breakdown. From the results of

the tests in both 1929 and 1930, the following seem to be the most suitable picking periods:—

C.O.P.—About the second to the third week in March.

Cleopatra (In which breakdown is seldom present).—About early to mid-April.

Ribston Pippin.—Early March.

It must be emphasised at this point, however, that maturity should be gauged by the fruit itself and not by any arbitrary date fixed on the calendar. The periods mentioned above refer to the results obtained in the past two seasons' work, but may vary from year to year.

The relation of temperature conditions to breakdown has received considerable study in recent years. Those varieties

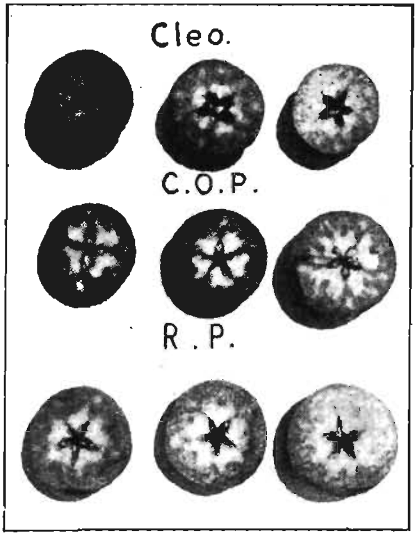


PLATE III.—CLEOPATRA, COX'S ORANGE PIPPIN, AND RIBSTON PIPPIN, SHOWING THE IODINE REACTION AT THIRD PICKING ON THE 27TH MARCH, 1930.

The middle specimen in each row indicates the average maturity reaction at this period. Note the advanced maturity of Ribston in comparison to both Cleopatra and Cox's Pippin.

subject to the over-ripe type can be controlled, to some extent, by lower temperatures, whilst other varieties, notably those which are hard, late season sorts, require higher storage temperatures for their successful storage.

SUMMARY.

1. Climatic and seasonal conditions appear to have a marked influence on the susceptibility of the fruit to bitter pit.
2. Picking maturity exercised a marked bearing on the extent to which bitter pit developed in storage, the *earlier* harvested fruit suffering particularly.

3. Picking maturity had considerable bearing on the extent to which internal breakdown developed after storage, the *later* harvested fruit suffering particularly.

4. Delay in storage after harvesting did not seem to have any influence on the subsequent development of bitter pit in the past season, though a higher percentage of the over-ripe type of breakdown occurred amongst such fruit in the Ribston Pippins.

5. In the past two seasons subsequent holding under ordinary temperature conditions for a period of two weeks did not appear to encourage further development of bitter pit, but with Cox's Orange Pippin in 1929 and Ribston Pippin in 1930 considerable breakdown resulted.

From the summary of results given above, the importance of carefully choosing the harvesting period for each variety of fruit should be evident. This is particularly so when the grower is dealing with varieties susceptible to such diseases as bitter pit and internal breakdown, especially when the fruit has to undergo 6 or 8 weeks storage previous to marketing.

SULPHUR—LIME-SULPHUR—FLOUR-PASTE SPRAY.

In response to requests received from a large number of orchardists, the formula for mixing and preparation of this spray is supplied:—

Ingredients:

	s.	d.
5 lb. ordinary flour, at 2d. lb.	0	10
5 lb. flour of sulphur, at 2d. lb.	0	10
1 gallon lime-sulphur, at 1s. 7d.	1	7
100 gallons of water		
Cost	3	3

The flour is made into a thick paste by first mixing it with a small quantity of cold water; to this about 5 gallons of boiling water is added, and, after thorough stirring, a thin liquid paste, without any lumps, should result.

Next take a small quantity of this thin paste and use it for mixing with the sulphur. When thoroughly wetted, the sulphur paste is combined with the flour paste, and, after again stirring, can be strained through a piece of hessian into a mixture of lime-sulphur (1—95) that has previously been prepared in the spray tank.

This spray has given good results in controlling summer infestation of red spider and powdery mildew, and is also useful in preventing late black spot infection.

Owing to the sulphur only being in suspension it must be applied by a pump fitted with an efficient agitator.

After the first experience the spray is very easy to prepare, and besides possessing useful fungicidal and insecticidal properties, has the additional merit of cheapness.

—*Horticultural Division.*

JUDGING FOWLS WITH A VIEW TO CULLING FOR EGG PRODUCTION AND BREEDING.

By G. MACRAE ROBERTSON, C.D.P., late Poultry Husbandryman.

IMPROVEMENT in our poultry depends largely on breeding. For successful breeding there must be a proper selection of individuals which possess the characteristics which we wish to perpetuate and improve. This means that the breeders must have produced a large number or high value of eggs in the case of the females, or come from hens having thus performed in the case of the male.

Trap-nesting or single penning are the only accurate means of telling the exact production. Even these methods might not be successful as in the case when attention is given only to number of eggs and not to such factors as health, vigour, size, breed, characters, freedom from defects of the stock, and quality of eggs.

For the purpose of selecting good quality laying and breeding stock, it is necessary to classify the knowledge regarding the bird itself under three headings:—

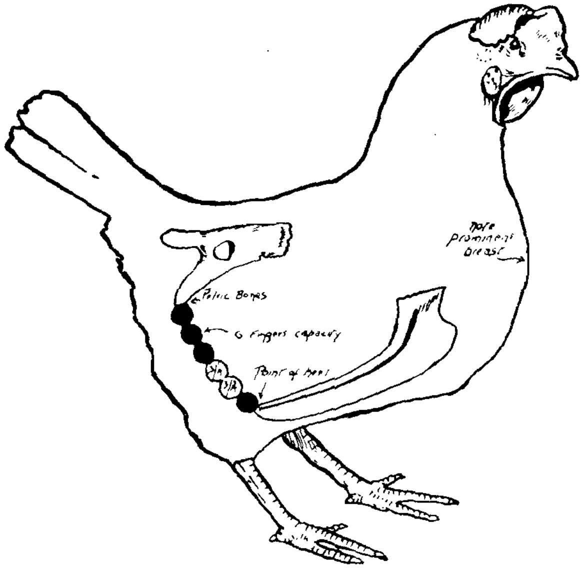
Anatomical
Physical
Temperamental.

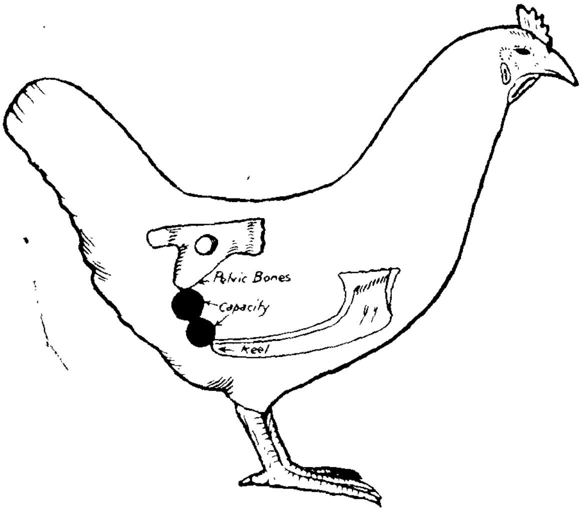
ANATOMICAL.

The most important of these characters can be indicated by describing a good bird. The head should be clean cut and well proportioned, set well forward on the neck, broad and flat across the top, wider at the top than at the bottom. The face should be full, the eye clear and prominent, the back fairly long and flat. There should be a good spread of rib or heart girth. The greater the bulge, the greater the capacity for development of heart and lungs, which function in purifying the blood and sending nutriment to all parts of the body. This measurement is usually taken at the back of the shoulders. The body from keel (breastbone) to the shoulders should be deep, and the keel carried well forward in order to give a full chest. Depth of body as measured from the middle of the back to the middle of the keel is essential. The breastbone should also slope away from the back towards the rear in order to increase abdominal capacity, which is essential for the intestines and reproductive system, both of which are much expanded in an actively laying hen.

A good bird is also wide in the back at the hips, and carries out the width well to the pelvic bones. Cutting in and falling away reduce the capacity. The keel must be medium to long

in order to give support to the larger abdomen, and it is an advantage when it curves up slightly.





PHYSICAL.

This indicates what the bird has accomplished in egg production in the past, or to what extent the bird has been operating. Pigmentation changes can be used as a guide in yellow-skinned varieties, as with production the yellow pigment disappears from the body. This loss is more pronounced in the softer parts of the body and where circulation is more rapid. It is possible to

estimate the time necessary for the various parts to bleach out, which gives a clue to the time the bird has been laying. This is only applicable in such cases where the birds possess yellow legs and beaks at the commencement of production.

The vent and eye-ring lose colour first, showing decided paleness after a few eggs have been laid. The ear-lobe does not fade as rapidly, usually requiring 2 to 3 weeks of laying. The beak begins to lose colour soon after laying begins, and by the time 30 eggs are produced there may be complete loss of pigment. This loss commences at the corner of the mouth. The shanks are the last to fade, requiring usually 4 to 6 months of steady production. By this time the vent will be fine and pinky, and the flesh between the pelvic bones and directly underneath will be pliable. (The lower producers will retain the yellow pigment in the shanks, the vent may be fleshy, and the flesh between and under the pelvic bones rubbery.) At a later period the sinews at the back of the shank become prominent. The fat of the feather is withdrawn, and the wing, body, and tail feathers, after ten months or so of steady production, become frayed because of the loss of fat. This method of comparison within a flock, and under the same conditions, is very reliable.

When production ceases or broodiness occurs, the pigment comes back again into the various parts more rapidly than it is lost.

The skin of the high-producer should be thin, soft, and flexible. This can be well determined along the keel and also in the comb and wattles. A skin of this type shows health and lack of a tendency to deposit fat. It also gives evidence of a similar condition in the linings of the internal organs.

The condition of the comb, vent, and abdomen and the distance between the pelvic bones indicates the laying condition of the bird at the time of examination. The hen in heavy lay has a full red comb, a moist dilated vent, distended abdomen, and considerable distance between the pelvic bones. These conditions indicate whether a hen is coming into or going out of production rather than the extent of production.

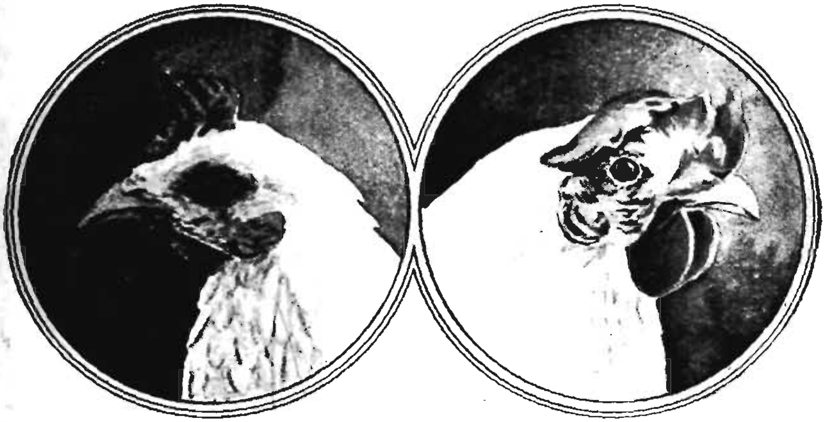
Moult is also a factor that can be used in judging production. It tells one how long the bird has probably been out of production by the manner in which the feathers are shed and the number of new feathers grown. The late moulters, as well as those that shed and grow feathers rapidly, are the best producers.

This moulting character is of value chiefly at the close of the laying season and preparatory to selecting potential breeders.

TEMPERAMENTAL.

The third group of characters is that relating to temperament. A good producer is friendly and alert. She seldom shows fear, but is rather defiant; she is not flighty, but is active. In this connection the head is an important part to study. It is the seat of nervous energy which controls all parts of the body. The

head should be strong, clean cut, and without fat, and the comb substantial; the eye bright, inquisitive, and challenging.



HEAD OF LOW PRODUCER.
Note small crusty comb, long beak, and dull eye.

HEAD OF HIGH PRODUCING HEN.
Note brilliancy and prominence of eye, size of comb and wattles, and shortness of beak.

This is in contrast to the head which is too small, badly proportioned, face either sunken or too coarse, a fat, or wrinkled comb, and expression dull and inactive.

VALUE IN CULLING.

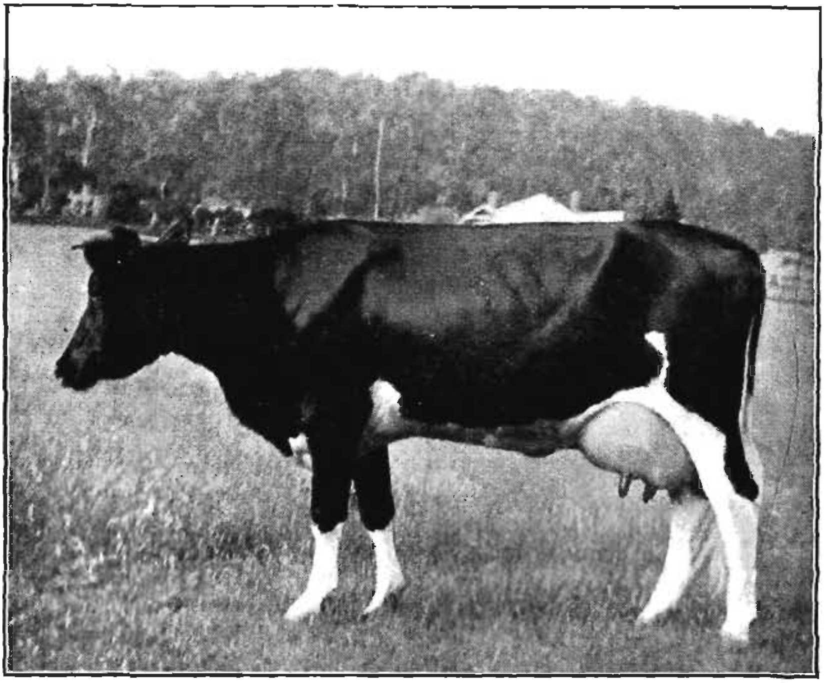
External characters are usually looked upon and used chiefly as a means of culling the unprofitable birds. This practice should begin at any time and be carried on systematically and regularly because of its economical value in saving feed and prompting better conditions for the remaining birds. It can also be used in selecting prospective breeders from the yearling stock. In this case the examination must be made just preparatory to the termination of the first season's laying period.

This practice, continued year after year, will result in breed improvement.

PURE-BRED HERD RECORDING SEASON, 1929-30.

Notes on the Year's Testing.

DURING the year 285 cows, contained in 32 herds, completed their test. The average butterfat production of all cows of all breeds and ages was 318·2 lb., an increase of 18·9 lb. of butterfat on the previous year, or an



MR. C. J. HAY'S FRIESIAN COW, ROAD'S END ALTHACA.

increase of 44·8 lb. per cow since 1920. The following table shows the number of cattle tested, and the average butterfat production, since 1919-20:—

Year.	No. of Cows.	Avge. Butterfat Production.	Year.	No. of Cows.	Avge. Butterfat Production.
1919-20	49	273·0	1926-27	99	339·2
1923-24	153	318·0	1927-28	166	317·6
1924-25	177	327·0	1928-29	234	299·3
1925-26	139	324·0	1929-30	271*	318·2

* Does not include Mr. McKenzie's herd (14 cows).

The average production of heifers was 287·2 lb., or an increase of 19·3 lb. over the previous year, or an increase of 78·2 lb. during the past 10 years.

A new two-year-old record has been established by Mr. C. J. Hay's Friesian Road's End Althaca. Commencing her test at the age of 2 years and 7 months, she produced, in 273 days, 18,607 lb. of milk and 654·8 lb. of butterfat, with an average test of 3·51 per cent. Continuing her test for 365 days, she yielded 24,043 lb. of milk and 880·1 lb. of butterfat, with an average test of 3·66 per cent.

LIST OF COWS IN ORDER OF MERIT.

MATURE COWS.

Standard: 350 lb. Butterfat.

No. and Name of Cow.	Breed.*	Herd Book Number.	Owner.	Age.	Date of Calving.	Milk. lb.	Test Per Cent.	Butterfat lb.
1. Hillstead Pretty Maid	J	12,767	Harding, W. T.	6.7	1.6.29	11,102	5.61	623.0
2. Allan Water Vesta 3rd	J	14,690	Champion, A.	7.0	27.8.29	8933	6.77	605.4
3. Relbia Ettie	J	15,732	Cannon, S. L.	5.11	28.6.29	10,377	5.03	523.5
4. Kellevie Empress de Kol	F		Hay, Willis	5.8	3.9.29	16,288	3.04	496.4
5. Allan Water Dolly 2nd	J	14,689	Champion, A.	7.0	30.8.29	7275	6.38	464.2
6. Palmerston Daphne 2nd ..	J	21,025	Proctor, C. A.	5.1	7.5.29	8667	5.22	452.8
7. Hillcrescent Charm 2nd ..	J	11,194	Cannon, S. L.	9.1	2.9.29	8176	5.51	450.7
8. Daphne 3rd of Enstone	MS	....	Steel, L. J.	5.0	7.9.29	10,689	4.13	442.4
9. Palmerston Silvy 2nd	J	14,357	Cowie, A. E.	7.0	16.9.29	8299	5.30	440.4
10. Rosevale Echo Sylvia Posch	F	2883	Richardson, G.	5.1	31.10.29	12,500	3.47	434.9
11. Allan Water Geraldine	J	12,754	Champion, A.	7.4	9.5.29	7912	5.36	424.7
12. Queechy Pretty Maid 2nd	J	23,755	Johnson, J. & G.	9.11	14.7.29	7762	5.43	421.9
13. Hillbrow Beauty	J	16,906	Townsend, A. W.	5.11	3.7.29	7588	5.48	416.1
14. Hillstead Ettie	J	12,762	Harding, W. T.	6.6	6.3.29	8407	4.87	410.1
15. Pansy of Pelerine	MS	..	Mackay, H. S.	5.10	13.7.29	8894	4.56	406.1
16. Palmerston Maid	J	16,874	Proctor, C. A.	5.5	13.5.29	7715	5.26	406.0
17. Palmerston Primrose	J	14,698	Townsend, A. W.	6.8	3.3.29	7197	5.59	402.7
18. Palmerston Bud 2nd	J	16,871	Cowie, A. E.	6.3	24.9.29	6877	5.82	400.6
19. Palmerston Floss 2nd	J	16,873	Cowie, A. E.	5.2	26.12.28	7597	5.26	400.1
20. Marisposa's Mist Wreath of Kameruka	J	12,806	Briggs, H., and Sons	7.4	15.9.29	7166	5.51	395.4
21. Roany of Enstone	MS	....	Steel, L. J.	6.0	16.8.29	8803	4.47	393.6
22. Palmerston Canary	J	14,352	Cowie, A. E.	6.6	18.12.28	6951	5.64	392.3
23. Palmerston Fairy 2nd ...	J	12,098	Loosmore, T. C.	8.2	19.9.29	7818	5.01	391.8
24. Hillstead Fancy	J	12,759	Cannon, S. L.	7.8	18.6.29	6733	5.72	385.5
25. Allan Water Dinkum Lass 2nd	J	13,251	Champion, A.	7.11	26.7.29	7237	5.31	385.0
26. Success of Enstone	MS	...	Steel, L. J.	5.0	6.9.29	11,455	3.35	384.5
27. Daphne 2nd of Endstone	MS	....	Steel, L J.	5.1	4.11.28	8289	4.60	381.4
28. Magician's Elf of Kameruka	J	12,117	Proctor, C. A.	7.2	20.5.29	7232	5.27	381.3
29. Moola Pansy	A	20,545	Wing, G., & Sons	6.9	2.8.29	8556	4.45	381.2
30. Venie of Moola	A	13,038	Wing, G., & Sons	8.0	27.8.29	8912	4.19	373.5
31. Hillstead Buttercup	J	12,760	Harding, W. T.	6.5	22.6.29	6692	5.57	373.0
32. Wyndham Pearl	J	11,164	Briggs, H., & Son	9.0	13.9.29	7096	5.23	371.3
33. Flowing Vale Fairy 2nd	RP	1784C	Thompson, J. H.	8.0	12.8.29	9663	3.80	367.3
34. Sophy of Endstone	MS		Steel, L. J.	9.0	1.8.29	8967	4.08	366.7
35. Palmerston Pansy	J	14,697	Townsend, A. W.	6.8	18.3.29	6803	5.37	365.8
36. Hawthorn 6th	A	....	Nettlefold, R.	10.1	5.11.28	9288	3.92	364.9
37. Flowing Vale Peachette	RP	1308C	Thompson, J. H.	8.0	22.8.29	9319	3.90	364.3
38. Hillstead Charm	J	15,712	Griffin, J. V.	5.5	16.11.28	6660	5.43	362.1
39. Hawthorn of Mt. Pleasant	A	....	Nettlefold, R.	11.0	8.9.29	9054	3.97	359.8
40. Lorna Doone 2nd of Mt. Pleasant	A	14,008	Nettlefold, R.	7.10	9.9.29	9229	3.84	355.0
41. Daphne of Pelerine	MS	..	Mackay, H. S.	7.0	30.8.29	8156	4.34	354.8
42. Rose 4th A of Pelerine	MS	...	Mackay, H. S.	5.7	1.6.29	7350	4.77	351.1
43. Mill Farm Blue Bell ..	J	19,164	Cannon, S. L.	5.1	22.8.29	6935	5.48	350.9
44. Camgrove Mayflower ..	J	12,757	Cowie, A. E.	7.1	2.9.29	6178	5.66	350.0
45. Dolly of Enstone	MS	..	Steel, L. J.	7.11	15.8.29	7707	4.54	350.0
46. Palmerston Fairy	J	11,131	Cowie, A. E.	8.11	22.8.29	6510	5.34	348.0
47. Hawthorn 9th of Banyule	J	11,583	Cowie, A. E.	7.1	2.7.29	7051	4.86	343.0
48. Palmerston Queenie	J	13,057	Cowie, A. E.	7.1	12.11.28	6524	5.23	341.6
49. Wyndham Pearl	J	11,164	Briggs, H., and Sons	8.1	1.10.28	6370	5.35	341.4
50. Royal Pet 2nd of Taraganda	J	12,809	Cowie, A. E.	7.1	31.3.29	6852	4.97	340.7
51. Pansy of Newington	MS	...	Mackay, H. S.	7.9	16.8.29	7494	4.45	333.6
52. Hillstead Roseleaf	J	12,770	Harding, W. T.	6.9	20.8.29	6237	5.31	331.6
53. Flowing Vale Starette 2nd	RP	1720B	Thompson, J. H.	6.7	12.3.29	7764	4.21	327.4
54. Palmerston Favourite	J	16,872	Cowie, A. E.	6.1	28.8.29	6127	5.31	325.9
55. Beauty of Moola	A	13,034	Wing, G., & Sons	8.8	29.9.29	7779	4.17	324.6
56. Daphne 2nd of Pelerine..	MS	....	Mackay, H. S.	6.0	24.8.29	7363	4.40	324.6
57. Hillstead Duchess	J	12,761	Harding, W. T.	7.9	3.7.29	6948	4.64	322.5
58. Success of Mayfield	MS	....	Steel, L. J.	10.5	14.10.28	7827	4.13	323.4
59. Newnham Ruac	J	12,122	Briggs, H., and Sons	6.5	10.4.29	6467	4.94	319.8
60. Victoria Titania	RP	724A	Blundstone, J. E.	7.8	6.5.29	7174	4.43	318.0
61. Victoria Battleflight	RP	1147A	Thompson, J. H.	6.3	21.8.29	7984	3.94	314.8
62. Victoria Tulip	RP	798B	Blundstone, J.	7.11	19.8.29	7294	4.28	312.8

* A. Ayrshire. J. Jersey. F. Friesian. M.S. Milking Shorthorn. R.P. Red Poll.

MATURE COWS—*continued.*

No. and Name of Cow.	Breed.*	Herd Book Number.	Owner.	Age.	Date of Calving.	Milk. lb.	Test Per Cent	Butterfat lb.
63. Relbia Bud	J	12,816	Harding, W. T.	6.4	20.9.29	6019	5.17	311.5
64. Dolly 3rd of Newington	MS	13,448	Mackay, H. S.	7.11	4.8.29	7166	4.34	311.0
65. Allan Water Viva	J	16,869	Champion, A.	5.8	10.8.29	5802	5.30	307.8
66. Mabel 16th of Pelerine	MS	14,027	Mackay, H. S.	7.10	9.8.29	7322	4.16	305.2
67. Hawthorn 2nd of Mt. Pleasant	A	...	Nettlefold, R.	10.3	19.12.28	8062	3.70	305.1
68. Newnham Some Maid	J	16,887	Heyes, W. C.	5.5	25.4.29	4801	6.19	297.3
69. Gladys 3rd of Martigny	A	12,738	Nettlefold, R.	5.2	15.1.29	6888	4.27	294.1
70. Minnie of Enstone	MS	....	Steel, L. J.	8.1	19.9.29	6429	4.54	291.8
71. Wyndham Bud	J	....	Mervyn Brae Co.	7.0	7.8.29	5308	5.46	290.0
72. Victoria Queen Regnant	RP	1285C	Thompson, J. H.	5.3	15.11.28	6563	4.38	287.7
73. Hillstead Favourite	J	12,765	Harding, W. T.	7.9	26.7.29	5748	4.97	286.1
74. Rose 6th of Pelerine	MS	....	Mackay, H. S.	7.10	30.8.29	6591	4.29	283.1
75. Harriett 4th of Darbalara	MS	11,746	Mackay, J. H.	8.8	26.10.28	7152	3.95	282.7
76. Alanvale Snowdrift	A	12,168	Hall, E. G.	5.11	13.10.28	7347	3.79	278.5
77. Victoria Mapleleaf	RP	719A	Thompson, J. H.	7.8	4.10.28	7469	3.72	278.3
78. Relbia Daphne	J	11,173	Heyes, W. C.	8.4	9.9.29	5173	5.35	277.0
79. Mona of Enstone	MS	....	Steel, L. J.	5.2	1.10.29	7135	3.86	275.9
80. Dolly of Pelerine	MS	13,444	Mackay, H. S.	7.0	11.9.29	6360	4.25	270.7
81. Rose 5th of Pelerine	MS	..	Mackay, H. S.	5.11	27.7.29	6409	4.14	265.4
82. Hillstead Ettie	J	12,764	Harding, W. T.	7.7	1.5.29	4666	5.55	259.0
83. Alanvale Winnie	A	12,170	Hall, E. G.	7.2	30.10.28	6892	3.74	258.0
84. Sweet Flower of Mt. Pleasant	A	.	Nettlefold, R.	9.5	14.1.29	6271	4.05	254.2
85. Lily 9th of Darbalara	MS	9896	Mackay, J. H.	11.8	29.10.28	6696	3.66	245.4
86. Mill Farm Lily 2nd	MS	..	Mackay, J. H.	7.2	14.12.28	6200	3.89	241.6
87. Snailey 2nd of Enstone	MS	.	Steel, L. J.	9.3	5.11.29	5886	4.10	241.0
88. Gladys 2nd of Martigny	A	12,736	Nettlefold, R.	6.0	9.12.28	6123	3.91	239.4
89. Allan Water Althea	J	16,864	Carruthers, F. W.	5.3	31.7.29	4596	5.06	232.6
90. Mill Farm Jessie	MS	13,855	Mackay, J. H.	6.1	14.10.28	5425	4.23	229.6
91. Gelderana B	RP	388C	Thompson, J. H.	8.7	29.7.29	6035	3.78	228.1
92. Victoria Red Seal	RP	1671A	Thompson, J. H.	5.3	18.11.28	6445	3.52	227.0
93. Harriett of Mill Farm	MS	13,770	Mackay, J. H.	6.2	17.12.28	5415	4.07	220.4
94. Victoria Zeeland	RP	2150B	Thompson, J. H.	5.5	17.1.29	4335	4.81	208.8
95. Nalinga Adriana	RP	....	Blundstone, J.	5.10	8.10.29	4795	3.70	177.5

* A. Ayrshire. J. Jersey. F. Friesian. M.S. Milking Shorthorn. R.P. Red Poll.

Total milk given: 703,793 lb. Total butterfat produced: 32,629.0 lb.

Average for Mature Cows.

Milk: 7408 lb. Average test: 4.63 per cent. Butterfat: 343.4 lb.

SENIOR FOUR-YEAR-OLDS.

Standard: 325 *lb. Butterfat.*

No. and Name of Cow.	Breed.*	Herd Book Number.	Owner.	Age.	Date of Calving.	Milk. lb.	Test Per Cent.	Butterfat lb.
1. Rosevale Queen Pontiac Inka	F	2889	Richardson, G.	4.11	10.10.29	14,051	3.71	522.0
2. Levengrove Musical Meg	J	19,137	Cannon, S. L.	4.11	30.7.29	8868	5.13	455.5
3. Lorna Doone 3rd of Mt. Pleasant	A	14,009	Nettlefold, R.	4.11	25.4.29	9724	4.15	404.5
4. Hillstead Gipsy	J	20,980	Harding, W. T.	4.8	28.4.29	6465	5.66	365.9
5. Valmont Mirrie	J	16,888	Heyes, W. C.	4.8	1.1.29	5703	6.36	363.2
6. Allan Water Felicity	J	20,935	Champion, A.	4.11	5.9.29	6243	5.48	342.5
7. Nalinga Topnotch	RP	1622A	Blundstone, J. E.	4.10	11.5.29	6621	5.02	332.8
8. Glenavon Lady Grace	A	14,863	Hall, E. G.	4.9	8.10.28	8454	3.90	329.7
9. Flowing Vale Socks	RP	1792C	Thompson, J. H.	4.10	15.8.29	7884	3.98	314.8
10. Relbia Dolly	J	15,728	Relbia F. & D. Co.	4.7	17.10.28	5681	5.52	313.9
11. Allan Water Roulette	J	20,943	Carruthers, F.	4.8	15.6.29	4416	5.68	251.1
12. Palmerston Lady	J	18,570	Cowie, A. E.	4.11	12.10.29	4610	5.24	241.8

* A. Ayrshire. J. Jersey. F. Friesian. M.S. Milking Shorthorn. R.P. Red Poll.

Total milk given: 88,720 lb. Total butterfat produced: 4237.7 lb.

Average for Senior Four-Year-Olds.

Milk: 7393 lb. Average test: 4.78 per cent. Butterfat: 353.1 lb.

JUNIOR FOUR-YEAR-OLDS.

Standard: 300 lb. Butterfat.

No. and Name of Cow.	Breed.*	Herd Book Number.	Owner.	Age.	Date of Calving.	Milk. lb.	Test Per Cent	Butterfat lb.
1. Rosevale Alta Posch	F	2878	Richardson, G.	4.1	19.11.28	17,009	3.65	621.6
2. Rosevale Korndyke Lassie	F	2886	Richardson, G.	4.1	28.11.28	13,311	3.46	460.5
3. Hallston Fancy	J	20,986	Cowie, A. E.	4.0	29.8.29	6677	6.47	432.4
4. Rosevale Echo Sylvia Posch	F	2883	Richardson, G.	4.0	9.10.28	11,670	3.68	430.3
5. Allan Water Venus	J	20,944	Champion, A.	4.2	2.7.29	6735	5.99	403.6
6. Mill Farm Ranee 11th	J	21,018	Mackay, J. H.	4.1	18.9.29	7243	5.51	399.2
7. Relbia Dainty	J	21,036	Mervyn Brae Co.	4.1	31.8.29	7503	4.97	373.3
8. Vanity of Moola	A	14,316	Wing, G., & Sons	4.1	20.10.28	7741	4.51	349.7
9. Palmerston Folly	J	20,920	Briggs, H. H.	4.1	25.8.29	6427	5.34	343.3
10. Allan Water Felicity	J	20,935	Champion, A.	4.1	11.10.28	5385	6.00	323.4
11. Daphne 3rd of Enstone	MS	..	Steel, L. J.	4.1	29.10.28	7401	4.32	319.7
12. Lotus of Moola	A	14,315	Ashley Home	4.1	26.11.28	7108	4.48	319.0
13. Hillbrow Jessie	J	....	Bramich, M. L.	4.2	29.4.29	6024	5.10	307.6
14. Hillstead Joyful	J	20,981	Harding, W. T.	4.2	21.8.29	5886	5.20	306.3
15. Success of Enstone	MS	...	Steel, L. J.	4.1	5.10.28	8212	3.61	296.9
16. Nalinga Adriana 2nd	RP	....	Blundstone, J.	4.3	18.2.29	6676	4.18	279.1
17. Zenda of Enstone	MS	..	Steel, L. J.	4.0	12.9.29	7035	3.91	275.6
18. Relbia Nina	J	19,176	Carruthers, F. H.	4.4	12.8.29	5532	4.91	271.8
19. Relbia Minnie	J	19,175	Carruthers, F. H.	4.4	23.8.29	5628	4.81	270.7
20. Hillstead Silver Bell	J	20,984	Harding, W. T.	4.5	9.11.28	4894	5.15	252.1
21. Daisy 2nd of Enstone	MS	....	Steel, L. J.	4.3	12.11.29	5884	5.15	244.5
22. Olga of Enstone	MS	...	Steel, L. J.	4.0	20.9.29	6043	3.95	239.1
23. Pansy of Enstone	MS	...	Steel, L. J.	4.0	6.9.29	4902	4.30	211.2
24. Rose 8th of Pelerine	MS	....	Mackay, H. S.	4.0	18.11.29	4325	4.65	201.4
25. Betty 2nd of Mt. Pleasant	A	.	Nettlefold, R.	4.1	5.3.29	5341	3.71	198.6
26. Relbia Viola	J	21,046	Carruthers, F.	4.0	28.10.29	3813	4.34	165.7
27. Flowing Vale Penny Belle	RP	1717B	Blundstone, J.	4.2	14.10.29	3873	3.60	139.4

* A. Ayrshire. J. Jersey. F. Friesian. M.S. Milking Shorthorn. R.P. Red Poll.

Total milk given: 188,278 lb. Total butterfat produced: 8436.0 lb.

Average for Junior Four-Year-Olds.

Milk: 6973 lb. Average test: 4.48 per cent. Butterfat: 312.4 lb.

SENIOR THREE-YEAR-OLDS.

Standard: 275 lb. Butterfat.

No. and Name of Cow.	Breed.*	Herd Book Number.	Owner.	Age.	Date of Calving.	Milk. lb.	Test Per Cent	Butterfat lb.
1. Rosevale Inka Sylvia Flora	F	2884	Richardson, G.	3.10	20.10.28	15.566	4.04	630.3
2. Rosevale Lady Colantha Posch	F	2887	Richardson, G.	3.9	13.11.28	15,156	3.86	585.2
3. Rosevale Beauty Sylvia Posch	F	2879	Richardson, G.	3.9	18.11.28	12,877	3.78	486.8
4. Levengrove Victor's Queen	J	20,927	Cannon, S. L.	3.10	1.7.29	7821	5.97	466.9
5. Rosevale Lady Hengerveld Posch	F	3206	Richardson, G.	3.9	30.7.29	13,275	3.50	465.2
6. Clifton Betty	J	20,965	Cannon, S. L.	3.11	22.6.29	6988	6.56	458.8
7. Rosevale Queen Pontiac Inka	F	2889	Richardson, G.	3.10	29.9.28	10,538	3.95	417.8
8. Levengrove Victorious Meg	J	20,928	Cannon, S. L.	3.10	21.8.29	8432	4.76	402.1
9. Rosevale Burkeyje Colantha Posch	F	2880	Richardson, G.	3.7	6.3.29	12,499	3.16	395.9
10. Flowing Vale Beauty Spot	RP	1774C	Blundstone, J.	3.7	5.4.29	9493	4.07	386.7
11. Hillbrow Fairy's Jean	J	21,062	Bramich, M. L.	3.9	28.4.29	5832	6.42	375.0
12. Allan Water Diana	J	20,933	Champion, A.	3.10	14.8.29	5127	6.76	346.8

* A. Ayrshire. J. Jersey. F. Friesian. M.S. Milking Shorthorn. R.P. Red Poll.

SENIOR THREE-YEAR-OLDS—*continued.*

No. and Name of Cow.	Breed.*	Herd Book Number.	Owner.	Age.	Date of Calving.	Milk. lb.	Test. Per Cent.	Butterfat lb.
13. Rosevale Pieterje Colantha Posch	F	3208	Richardson, G.	3.11	26.2.29	10,215	3.33	340.5
14. Hillbrow Molly	J	21,065	Townsend, A.	3.7	27.5.29	6089	5.52	336.4
15. Flowing Vale Dodger 3rd	RP	1783C	Blundstone, J.	3.8	12.5.29	7477	4.28	320.4
16. Hillstead Dot	J	23,744	Griffin, J. V.	3.10	2.10.28	5109	6.10	311.8
17. Mill Farm Ranee 10th	J	21,017	Mackay, J. H.	3.11	22.10.28	5727	5.40	309.3
18. Moola Betty	A	16,493	Wing, G., & Sons	3.11	8.9.29	6709	4.38	293.9
19. Flowing Vale Diana	RP	1781C	Blundstone, J.	3.8	26.5.29	6962	4.16	289.8
20. Jean of Mt. Pleasant	A	....	Nettlefold, R.	3.10	19.12.28	7041	4.02	283.3
21. Heathfield Queenie	J	....	Loosmore, T. C.	3.11	26.9.29	5508	5.09	280.4
22. Allan Water Clotho	J	20,931	Carruthers, F.	3.10	9.8.29	4734	5.63	266.7
23. Salford Waverley Lass 5th	J	23,580	Johnson, J. & G.	3.8	23.7.29	4385	6.03	264.7
24. Moola Myrtle	A	16,494	Ashley Home	3.11	22.9.29	6171	4.18	258.0
25. Ruby of Mt. Pleasant	A	....	Nettlefold, R.	3.6	6.12.28	6158	4.16	256.7
26. Hillbrow Daisy	J	....	Bramich, M. L.	3.8	16.7.29	5406	4.47	242.1
27. Flowing Vale Goldie	RP	1424AA	Blundstone, J.	3.10	15.7.29	5940	5.96	235.3
28. Emita Rosebud	J	19,148	Cooper, A. R.	3.10	11.10.28	4125	5.32	219.7
29. Flowing Vale Cherry Blossom	RP	1421AA	Blundstone, J.	3.11	11.6.29	5919	3.65	216.1
30. Nalinga Tulip 2nd	RP	....	Blundstone, J.	3.6	1.10.29	4119	3.92	161.6

* A. Ayrshire. J. Jersey. F. Friesian. M.S. Milking Shorthorn. R.P. Red Poll.

Total milk given: 231,398 lb. Total butterfat produced: 10,304.2 lb.

Average for Senior Three-Year-Olds.

Milk: 7713 lb. Average test: 4.45 per cent. Butterfat: 343.4 lb.

JUNIOR THREE-YEAR-OLDS.

Standard: 250 *lb. Butterfat.*

No. and Name of Cow.	Breed.*	Herd Book Number.	Owner.	Age.	Date of Calving.	Milk. lb.	Test Per Cent.	Butterfat lb.
1. Melton Vale Zoe	J	20,997	Cowie, A. E.	3.5	24.9.29	7577	5.24	397.3
2. Rannoch Valinda	J	21,049	Sadler, B. T.	3.1	25.5.29	6560	5.85	384.3
3. Hillbrow Laurel	J	21,064	Townsend, A. W.	3.1	26.5.29	6244	6.06	378.4
4. Rosevale Verbelle Pieterje Posch	F	2890	Richardson, G.	3.3	5.1.29	10,573	3.54	374.5
5. Palmerston Hawthorn	J	24,726	Cowie, A. E.	3.0	20.7.29	6799	5.46	371.6
6. Salford Crevy 5th	J	23,576	Johnson, J. & G.	3.0	4.5.29	6677	5.38	359.9
7. Rannoch Valrose	J	21,053	Sadler, B. T.	3.0	26.5.29	4858	7.36	357.8
8. Allan Water Minerva	J	20,940	Champion, A.	3.0	14.10.28	5535	5.96	330.3
9. Rosevale Sylvia Catrina Posch	F	3209	Richardson, G.	3.4	4.1.29	9875	3.14	310.2
10. Palmerston Coral	J	20,951	Cowie, A. E.	3.5	6.6.29	4754	6.42	305.4
11. Mill Farm Ranee 11th	J	21,018	Mackay, J. H.	3.2	3.10.28	5608	5.39	302.4
12. Relbia Una	J	21,044	Heyes, W. C.	3.4	28.6.29	4919	5.78	284.7
13. Alan Vale Frolic	A		Hall, E. G.	3.0	5.10.28	6824	4.11	280.8
14. Burnside Melody 2nd	J		Mackay, J. H.	3.2	21.9.29	5065	5.52	279.7
15. Daisy 3rd of Enstone	MS		Steel, L. J.	3.1	7.9.29	5819	4.37	254.6
16. Moola Myrtle	A	16,494	Ashley Home	3.0	16.10.28	4762	4.91	233.3
17. Rose 9th of Pelerine	MS	....	Mackay, H. S.	3.1	6.9.29	5616	4.12	231.5
18. Mill Farm Lily 7th	MS	..	Mackay, J. H.	3.1	14.11.28	5339	4.16	222.6
19. Dolly 2nd of Enstone	MS	....	Steel, L. J.	3.1	5.9.29	4974	4.45	221.6
20. Rose 7th of Pelerine	MS	....	Mackay, H. S.	3.0	10.11.28	5166	4.15	214.7
21. Lily 2nd of Enstone	MS	....	Steel, L. J.	3.3	9.11.28	4629	4.59	212.6
22. Mabel 3rd of Pelerine	MS	....	Mackay, H. S.	3.2	14.11.28	3851	4.62	178.1
23. Alice 2nd of Pelerine	MS	....	Mackay, H. S.	3.0	24.9.29	3692	4.38	161.8

* A. Ayrshire. J. Jersey. F. Friesian. M.S. Milking Shorthorn. R.P. Red Poll.

Total milk given: 135,716 lb. Total butterfat produced: 6648.1 lb.

Average for Junior Three-Year-Olds.

Milk: 5900 lb. Average test: 4.89 per cent. Butterfat: 289.0 lb.

SENIOR TWO-YEAR-OLDS.

Standard: 225 lb. Butterfat.

No. and Name of Cow.	Breed.*	Herd Book Number.	Owner.	Age.	Date of Calving.	Milk. lb.	Test. Per Cent	Butterfat lb.
1. Road's End Althaca	F	....	Hay, C. J.	2.7	4.6.29	18,607	3.51	654.8
2. Palmerston Maid 2nd	J	24,727	Cowie, A. E.	2.9	1.7.29	7805	5.11	398.9
3. Rannoch Silver Pride 2nd	J	21,048	Loosmore, T. C.	2.11	20.7.29	6828	5.73	391.7
4. Hillbrow Fairy's Belle	J	21,061	Townsend, A. W.	2.10	4.7.29	6675	5.71	381.4
5. Rannoch Valette	J	21,050	Sadler, B. T.	2.10	6.7.29	6610	5.61	371.3
6. Palmerston Maybloom	J	24,728	Cowie, A. E.	2.9	14.7.29	6551	5.26	344.8
7. Rannoch Rosalika	J	23,771	Sadler, B. T.	2.11	18.9.29	5697	5.80	330.7
8. Hillbrow Peggy	J	21,067	Townsend, A. W.	2.11	23.4.29	5748	5.73	329.3
9. Palmerston Pearl 3rd	J	24,729	Cowie, A. E.	2.9	13.8.29	5952	5.50	327.8
10. Rannoch Girl	J	23,770	Mervyn Brae Co.	2.10	3.9.29	5443	5.96	324.5
11. Hillbrow Repose	J	21,068	Townsend, A. W.	2.10	10.5.29	5435	5.84	317.5
12. Hawthorn's Maid of Mt. Pleasant	A	..	Nettlefold, R.	2.8	8.12.28	7406	4.26	316.1
13. Rannoch Daisy 3rd	J	23,769	Sadler, B. T.	2.9	31.8.29	4822	6.23	300.8
14. Rannoch Valass	J	21,051	Sadler, B. T.	2.10	6.7.29	5445	5.46	297.3
15. Glen Vina Silvy	J	21,024	Proctor, C. A.	2.10	12.4.29	4979	5.88	293.2
16. Hillstead Laurel	J	23,749	Harding, W. T.	2.7	25.8.29	5315	5.24	278.9
17. Relbia Iris	J	23,766	Heyes, W. C.	2.9	11.9.29	3603	7.37	265.5
18. Hillstead First Choice	J	23,745	Harding, W. T.	2.6	22.3.29	4690	5.03	236.2
19. Allan Water Eunice	J	23,721	Champion, A.	2.11	26.8.29	3760	6.16	231.8
20. Allan Water Verity	J	23,730	Champion, A.	2.9	31.7.29	4158	5.16	214.8
21. Allan Water Myrtle	J	23,727	Carruthers, F.	2.11	5.8.29	3744	5.35	200.6

* A. Ayrshire. J. Jersey. F. Friesian. M.S. Milking Shorthorn. R.P. Red Poll.

Total milk given: 129,273 lb. Total butterfat produced: 6807.9 lb.

Average for Senior Two-Year-Olds.

Milk: 6155 lb. Average test: 5.26 per cent. Butterfat: 324.1 lb.

JUNIOR TWO-YEAR-OLDS.

Standard: 200 lb. Butterfat.

No. and Name of Cow.	Breed.*	Herd Book Number.	Owner.	Age.	Date of Calving.	Milk. lb.	Test. Per Cent	Butterfat lb.
1. Winlaton Ashlynn Beets	F	2966	Hay, C. J.	2.2	9.10.28	14.453	3.29	465.5
2. Martigny Queen Pontiac	F	...	Richardson, G.	1.11	31.7.28	12,343	3.57	442.3
3. Winlaton Catriona Alcarta	F	3276	Hay, C. J.	2.0	12.10.28	13,241	3.22	438.4
4. Hillcrescent Charm 3rd	J	...	Cannon, S. L.	2.0	15.8.29	6584	5.87	387.1
5. Rannoch Linda's Lady 2nd	J		Sadler, B. T.	2.0	11.8.29	6892	5.60	386.0
6. Winlaton Gipsy Alcarta	F	3279	Hay, C. J.	2.0	1.10.28	11,855	3.20	379.8
7. Relbia Betty	J		Heyes, W. C.	1.10	26.7.29	6231	5.86	365.5
8. Levengrove Nanette	J	23,719	Cannon, S. L.	2.4	17.12.28	6223	5.66	352.3
9. Levengrove Nanette 2nd	J	....	Cannon, S. L.	1.5	3.1.29	6009	5.70	343.0
10. Tulip of Mt. Pleasant	A	:	Nettlefold, R.	2.0	12.12.28	7279	4.61	336.0
11. Olivedale Barbara	A	18,822	Hall, E. G.	2.1	19.11.28	5257	4.42	332.5
12. Clifton Joan	J	23,741	Cannon, S. L.	2.5	14.3.29	5941	5.52	328.4
13. Gladys 4th of Martigny	A	....	Nettlefold, R.	2.3	10.12.28	7813	4.18	327.0
14. Hillbrow Dora	J	23,782	Townsend, A. W.	1.10	15.8.29	5445	5.93	323.3
15. Rannoch Belle	J	....	Sadler, B. T.	1.9	30.6.29	5277	6.05	319.5
16. Levengrove Verbena	J	...	Cannon, S. L.	1.11	8.8.29	5213	6.12	319.1
17. Rannoch Silver Pride 3rd	J	...	Sadler, B. T.	1.11	11.9.29	5659	5.51	311.8
18. Palmerston Charity	J	..	Cowie, A. E.	1.11	24.6.29	5402	5.57	301.0
19. Rannoch Vallerie	J	....	Sadler, B. T.	1.9	25.6.29	5054	5.94	300.2
20. Rannoch Daisy 4th	J	...	Sadler, B. T.	1.10	11.9.29	5088	5.83	297.1
21. Valmont Royal Pet	J	24,741	Briggs, H., and Sons	1.11	26.2.29	5277	5.52	291.6
22. Moola Primrose	A	..	Wing, G., and Sons	2.0	22.9.29	5303	4.31	288.8
23. Hilibrow Poppy	J	23,786	Bramich, M. L.	1.8	30.5.29	5383	5.39	288.4
24. Hillbrow Lilac	J	23,784	Townsend, A. W.	2.2	30.6.29	5278	5.46	288.1
25. Rannoch Vallelo	J	....	Sadler, B. T.	2.0	20.9.29	4896	5.88	288.0
26. Levengrove Elizabeth	J	.	Cannon, S. L.	2.0	24.9.29	5700	5.00	285.3
27. Lilac of Mt. Pleasant	A	..	Nettlefold, R.	2.1	6.12.28	7035	4.03	283.5
28. Moola Violet	A	16,495	Wing, G., and Sons	2.1	4.10.28	6565	4.29	281.8
29. Relbia Spray	J	....	Cannon, S. L.	2.2	26.9.29	5705	4.92	281.0
30. Rannoch Silver Maid 2nd	J	...	Sadler, B. T.	1.10	28.5.29	4547	6.14	279.3
31. Rannoch Silver Daisy 2nd	J	...	Sadler, B. T.	1.10	12.7.29	4330	6.38	276.5
32. Burnside Melody 2nd	J	..	Mackay, J. H.	2.2	2.10.28	4571	5.87	268.5
33. Allan Water Felicity 2nd	J	23,722	Champion, A.	2.1	14.10.28	4783	5.51	263.4
34. Hillbrow Maida	J	2378	Bramich, M. L.	1.8	1.4.29	4107	6.36	261.4

JUNIOR TWO-YEAR-OLDS—*continued.*

No. and Name of Cow.	Breed.*	Herd Book Number.	Owner.	Age.	Date of Calving.	Milk. lb.	Test. Per Cent	Butterfat lb.
35. Glen Vina Fairy	J	....	Proctor, C. A.	1.8	9.4.29	4584	5.67	260.1
36. Daisy 3rd of Enstone	MS	...	Steel, L. J.	2.3	28.11.28	6166	4.21	260.1
37. Hillstead Jewel	J	....	Harding, W. T.	2.3	30.8.29	4738	5.42	257.2
38. Knole Firefly	J	....	Proctor, C. A.	2.0	21.4.29	5003	5.07	253.9
39. Palmerston Hawthorn 2nd	J	....	Cowie, A. E.	2.1	22.9.29	4344	5.75	250.1
40. Clifton Patience	J	23,742	Griffin, J. V.	2.3	18.11.28	4596	5.40	248.3
41. Scottsdale Fairy	J	24,721	Briggs, H. H.	2.3	7.8.29	4153	5.93	246.3
42. Wingaroo Rahra	RP	2356A	*Thompson, J. H.*	*2.4*	*19.6.29*	*6756*	*3.59*	242.5
43. Hillstead Pretty Bell	J	...	Harding, W. T.	2.1	26.8.29	4366	5.36	234.3
44. Wingaroo Quatrun	RP	2445B	Thompson, J. H.	2.3	21.5.29	4649	4.81	223.8
45. *Hillstead Gladsome*	J	23,746	Harding, W. T.	2.1	12.10.28	4050	5.47	221.6
46. Clifton Pearl	J	23,743	Griffin, J. V.	2.1	3.10.28	4086	5.33	217.9
47. Moola Vida 2nd	A	18,631	Wing, G., & Sons	2.2	24.12.28	5638	3.83	216.2
48. Allan Water Stella 3rd	J	...	Champion, A.	2.0	12.9.29	3919	5.44	213.4
49. Alanvale Expectation's Farewell	A	..	Hall, E. G.	2.2	4.12.28	5145	4.14	213.3
50. Hillbrow Fairy's Rosa	J	23,783	Townsend, A. W.	1.7	22.3.29	3338	6.29	210.2
51. Burnside Twiddlewinks 3rd	J	...	Mackay, J. H.	2.2	15.11.28	4272	4.92	210.2
52. Hillstead Handsome Bell	J	....	Harding, W. T.	1.11	3.8.29	3700	5.63	208.4
53. Palmerston Fancy	J		Loosmore, T. C.	1.11	12.9.29	4118	5.00	205.9
54. Knole Berry	J	21,027	Relbia F. & D. Pty.	2.1	2.11.28	4114	4.99	205.7
55. Brumby's Patience	A	15,781	Brumby, A. D.	2.1	24.10.28	4482	4.45	199.7
56. Sophy 3rd of Enstone	MS	...	Steel, L. J.	2.2	6.9.29	5185	3.65	189.6
57. Hillstead Golden Bell	J	..	Harding, W. T.	1.11	1.9.29	3455	5.14	177.7
58. Scottsdale Bud	J	.	Briggs, H. H., & Son	1.9	22.8.29	3249	5.41	175.8
59. Hillstead Silver Queen		23,570	Harding, W. T.	2.2	11.11.28	3420	4.89	167.3
60. Meadowcroft Violet	J	.	Carruthers, F.	2.0	4.10.29	5153	5.06	159.6
61. *Dolly 3rd of Enstone*	MS	....	Steel, L. J.	2.3	4.1.30	2295	4.24	98.4

* A. Ayrshire. J. Jersey. F. Friesian. M.S. Milking Shorthorn. R.P. Red Poll.

Total milk given: 339,713 lb. Total butterfat produced: 16,747.9 lb.

Average for Junior Two-Year-Olds.

Milk: 5569 lb. Average test: 4.92 per cent. Butterfat: 274.5 lb.

EXTENDED TESTS.

List of Cows in Order of Merit.

MATURE COWS.

No. and Name of Cow.	Breed.*	Herd Book Number.	Owner.	Age.	Date of Calving.	Milk. lb.	Average Test.	Butterfat lb.	Number of Days.
1. Flowing Vale Starette 2nd	RP	17,203	Thompson, J. H.	6.7	12.3.29	9584	4.14	396.7	365
SENIOR FOUR-YEAR-OLDS.									
1. Rosevale Doreen Sylvia	F	2882	Richardson, G.	4.7	14.8.28	20,496	3.29	674.6	338
JUNIOR FOUR-YEAR-OLDS.									
1. Rosevale Alta Posch	F	2878	Richardson, G.	4.1	19.11.28	19,718	4.16	746.3	365
2. Rosevale Korndyke Lassie	F	2886	Richardson, G.	4.1	28.11.28	15,161	3.47	527.6	365
SENIOR THREE-YEAR-OLDS.									
1. Rosevale Inka Sylvia Flora	F	2884	Richardson, G.	3.10	20.10.28	18,020	4.07	735.0	365
2. Rosevale Lady Colantha Posch	F	2887	Richardson, G.	3.9	13.11.28	17,446	3.88	678.1	340
3. Rosevale Beauty Sylvia Posch	F	2879	Richardson, G.	3.9	18.11.28	14.691	3.78	556.6	335
SENIOR TWO-YEAR-OLDS.									
1. Road's End Althaca	F	....	Hay, C. J.	2.7	4.6.29	24,043	3.66	880.1	365
JUNIOR TWO-YEAR-OLDS.									
1. Winlaton Ashlynn Beets	F	2966	Hay, C. J.	2.2	9.10.28	18,760	3.29	617.5	365

COWS NOT CLASSIFIED.

No. and Name of Cow.	Breed.*	Herd Book Number.	Owner.	Age.	Date of Calving.	Milk. lb.	Average Test.	Butterfat lb.	Number of Days.
1. Ladybank Mattie	A	....	Relbia F. & D. Pty.		22.10.28	6915	3.77	261.2	273
2. Daisy	MS	....	Von Stieglitz		3.10.28	3863	4.64	179.4	273

* A. Ayrshire. J. Jersey. F. Friesian. M.S. Milking Shorthorn. R.P. Red Poll.

REDUCED YIELDS DUE TO INFERIOR SEED.

By A. H. WOODFORDE, Senior Seed Analyst.

THE sowing of inferior seed is capable of causing decreases in crop yields, which may mean all the difference between a reasonable profit and a mere margin above expenses. Seed which germinates poorly results in scanty crops, which, however well individual plants may do, cannot give the same yield per acre as if every seed had produced a plant. Furthermore, the vitality of seed which germinates badly is likely to be low, in which case those seeds that do germinate may give rise to weak plants unable to withstand the effects of drought or the weed competition which is inevitable in a crop that does not occupy all the ground.

Poor germination and low vitality in seeds may be the outcome of any one or all of the following causes:—

1. Immaturity.
2. Unfavourable seasonal conditions prior to harvesting.
3. Bad storage conditions.
4. Age.

The Retention of Vitality is Closely Connected With the Moisture Content of the Seed. The lower this can be kept the longer vitality will be retained. (Moisture content refers to the moisture remaining in the seed after harvest, or absorbed from the atmosphere during storage.)

The moisture content of immature seeds is relatively high, and, principally for this reason, they decline in vitality more rapidly than well-matured seeds. They are also likely to be deficient in the food reserves that sustain the young plant until it is able to gather food for itself through its roots and leaves.

Humid conditions when the seed crop is approaching maturity also result in the retention of too much moisture, even though the seed is afterwards dried. Such seed may give satisfactory results if sown shortly after harvest, but rapidly loses its vitality on keeping.

THE EFFECTS OF AGE AND BAD STORAGE.

Well-matured seed, containing a minimum amount of moisture, will keep for long periods if stored in airtight containers. Under ordinary storage conditions, however, seeds absorb relatively large amounts of moisture from the atmosphere. The deterioration which follows will eventually result in the complete loss of power to germinate, though seeds differ considerably in their resistance to unfavourable influences. In many cases vitality will have declined after two or three years sufficiently to cause lowered crop yields. The rate of deterioration is considerably increased when seeds are kept in damp stores, especially if they are also overheated.

GERMINATION SPEED AND ITS RELATION TO VITALITY.

Seed of high vitality is usually characterised by rapid germination. For this reason seed-vitality is commonly measured by the speed with which a sample germinates. To illustrate this point, suppose two lines of Italian ryegrass seed both show a growth of 90 per cent. after 14 days—one with a 5-day germination of 85 per cent., the other germinating only 30 per cent. in the same time. The first line is a highly virile one, and, should drought or weed competition arise after sowing, would be more able to withstand such effects than the second line, a good many plants of which would probably succumb to the same conditions. Germination speed may be regarded as one of the most important items of information one should possess about a line of seed.

PURITY AND ITS RELATION TO ECONOMIC CROP PRODUCTION.

Nearly all lines of Agricultural seed contain impurities. Some of these are comparatively insignificant, consisting, as they do, of inert matter such as chaff, leafy and stemmy matter, soil, sand, broken seeds, &c., which, so long as they do not occur to an extent sufficient to significantly affect the value of the seed in relation to its price, can be more or less ignored.

WEED SEEDS.

In well-cleaned lines these seldom aggregate more than one-half per cent., a quantity which, in the case of such relatively harmless weeds as ribgrass, chickweed, dandelion, &c., already well-established on most farms, has little significance. Occasionally, however, samples contain the seeds of weeds, which no farmer would have on his land under any circumstances. The presence of only three or four of the seeds of such weeds as Californian thistle, white weed, ragwort, or twitch (*Agropyrum repens*), per ounce, would place any sample, however good otherwise, in the category of seeds unfit for sowing.

Badly-cleaned seed is liable to contain relatively large amounts of weed seeds, which, even if they are of the commoner species already flourishing on most farms, will result in considerable fouling of the land if they are present to excess. The occurrence in a sample of only two per cent. by weight of weed seeds of a size similar to those of sorrel would mean approximately 20,000 per pound. If these were contained in grass seed, which is usually sown at the rate of about 30 lb. per acre, every square yard would be sown with approximately 130 weed seeds.

Weeds are becoming a serious problem on some of our farms, and there can be little doubt that the position is aggravated by the sowing of dirty seed. Weeds reduce yields by smothering out the weaker plants and depriving the crop of food, light, and moisture. They also result in a lot of unnecessary labour, especially where they are of the more tenacious kind that keep on recurring in spite of control measures.

THE FARMER'S PROTECTION AGAINST INFERIOR SEED.

The average person is unable to estimate the value of a line of seed, no matter how carefully he examines it. Colour, smell, and general appearance certainly give some guide to the degree of maturity and freshness, but may be misleading. Cases have been known of dingy-appearing and musty-smelling seed germinating over 90 per cent., and conversely, of fresh, bright seed germinating poorly. As far as impurities are concerned, few people are able to recognise more than half-a-dozen of the commonest weed seeds, and most would probably fail to detect the seeds of noxious weeds if they were present.

THE SEED-TESTING STATION.

Journal No. 1 (New Series), November, 1929, gives a detailed description of the methods employed in this laboratory. Farmers' samples are accepted for purity and germination tests at a nominal charge of 2s. per sample. The charge for "germination only" tests is 1s. In the case of grass and clover seed, farmers are advised to have samples tested for purity as well as germination, as it is in these seeds that weed impurities are most likely to be found. Moreover, the combined test gives a more comprehensive idea of the real value of the seed.

Tests are commenced immediately samples are received at the laboratory, and reports are posted without delay.

REPORTS.

Two reports are issued, the first (interim report) after the germination test has been in progress for three to seven days (depending on the kind of seed) and the final at the completion of the test. The purpose of the *interim report* is to give the earliest possible information regarding the sample and to indicate the *vitality* of the seed as shown by the *germination speed* (i.e., the percentage of growth in the first few days). From this information an opinion can usually be formed as to whether the seed is good enough to sow, and an opportunity is thus afforded of trying out another line if necessary without losing valuable time.

ERRATUM.

In the Journal of 1st November, 1930, on page 236, second paragraph, line 4, of the reference to investigations in pollination by A. N. Raws Wisley, the word "self-sterile" should read "self-fertile."

FORK STAB ROT OF EARLY POTATOES.

Preliminary Note.

By W. J. DOWSON, M.A., D.Sc., Plant Pathologist.

FOR some years past considerable loss has occurred in consignments of early export potatoes by reason of the presence of a soft, black rot, and although the greatest care has been exercised at the ports to prevent the shipment of such potatoes by careful picking over, yet on arrival at Sydney further rotted tubers are often found. Indeed, the presence of the trouble at the port of destination is rendered evident by the stained nature of bags which are spoken of as being " spotted." This " spotting " of the bags is due to complete collapse during transit of affected tubers, which are reduced to a watery, evil-smelling mass.

This type of rot only occurs during the hottest months of the year, that is, during January, February, and March, but in some years, when these months are cooler than usual, the disease is nearly absent. One other point has also been observed in connection with this particular rot, and that is the invariable presence of mechanical injury of the affected tubers. This is so constant that a recent regulation has prescribed for the total rejection of injured tubers, or, to quote the regulation: " Early potatoes for export must be 100 per cent. free from mechanical injury." On the wharves the trouble is known as " fork stab," because that is the commonest type of injury present in consignments. But the stab of a fork is not the only injury to which tubers are subjected from the time they are lifted until they are loaded in the ship's hold; bruising of any sort is sufficient to start the rot, and, as everyone knows, potatoes dug immature as early export potatoes always have extremely thin and tender skins. The rot does not occur on tubers still attached to the plant.

The appearance of the rot is very characteristic: surrounding the stab or abrasion the skin is soft, dark in colour, and is often stretched flat, due to shrinkage of the internal parts. If this skin should become ruptured, as very often happens in handling, a thin, watery liquid is exuded, leaving a thin, papery skin over a soft, discoloured cavity. The rot spreads extremely rapidly, involving the whole tuber in a day or two during hot weather. The actual colour of the diseased flesh depends upon whether or not air has had access to the wound. Where fork stab is involved, and this is the commonest form of injury, air gets in, and the rotting tissue becomes first of all greyish, then brown, and finally almost black. On the other hand, infection may take place through a slight abrasion of the skin in which there is no large wound for air to enter, and in such instances the diseased flesh is but slightly discoloured and is hardly to be distinguished from the surrounding healthy parts.

When exposure to air has taken place the diseased flesh becomes sharply marked off from the still healthy part by a black line. In the early stages the diseased flesh has only a slight odour, but sooner or later a secondary invasion of putrefying bacteria takes place, which renders the decaying mass most disagreeable to the nose.

This type of rot is not confined to Tasmania, but has been known since 1916 in the United States, where it is called " leak," and occurs in consignments shipped from the delta region of the San Joaquin River, California. Quite recently the same trouble has occurred in Great Britain, following the hot summer of 1929, and forms the subject of an illustrated article in the July number of the " Journal of the Ministry of Agriculture," 1930, in which the trouble is called " a watery wound rot of the potato tuber." In that article it is shown quite conclusively that the actual parasite responsible for the rot is not a bacterium, as has been supposed, but a well-known fungus called *Pythium de Baryanum*, better known to horticulturists and others as one of the causes of " damping-off " of seedlings. It is interesting to note that the seedling disease only occurs at *high* temperatures accompanied by excessive moisture.

The history of the Tasmanian disease has been closely paralleled by the much more recent outbreak in England, as the following quotation from the abovenamed article of the English Ministry's Journal will show:—

> " . . . It is to be noted that the disease is contracted from a parasitic fungus present in the soil, and that the return of the rotten tubers to the soil is a sure way of maintaining, and even increasing, its presence there. Such a proceeding is quite contrary to the demands of proper crop hygiene, and should not be followed. It is instructive to learn that this particular rot was prevalent on the land of certain farmers who do not make a practice of gathering up and destroying all diseased tubers after lifting time, whereas their neighbours who go to the trouble of doing this as a matter of routine did not suffer."

Now, this is exactly what has been going on in Tasmania for many years. The rot was first noticed in one or two districts and from one or two farmers where such careless methods were in vogue, and it cannot be too strongly urged upon farmers that the proper way to dispose of damaged produce is to boil it and feed it to pigs, or else to bury it deeply in the ground. Feeding such damaged crops unboiled is only another way of spreading any disease-producing organisms which may be present, as they pass through animals unharmed.

The first precaution to be taken by farmers in controlling and checking this particular rot is to see that greater care is exercised at digging and bagging, especially the former. The modern potato-fork, with its rounded tynes, is largely responsible for the increase of the trouble, for a stab from such a fork rarely breaks the tuber into separate pieces. It is usual to withdraw the fork from a stabbed tuber by holding the tuber down by one's boot, thus causing further damage by rubbing off the immature skin. The old-fashioned fork with square-angled tynes did not allow of this, for any potato struck by such an implement was shattered into pieces quite useless for marketing. The second precaution to be taken is in bagging and loading the lorry. The use of hooks is to be avoided as far as possible, and these should only be in the hands of experienced persons who

know how to place the hook into the seams and ends of a bag, thus avoiding piercing the tubers.

The danger of damage to the tubers already bagged is that although they may be quite free from fork stab and are sound, yet a certain amount of soil goes into the bags with them, and thus provides the source of infection should further mechanical injury take place, as *Pythium de Baryanum* is present in many soils, especially of certain districts. The same care in handling should be observed in off-loading lorries, in stacking at the wharves for inspection, and in loading into the ships' holds. There is probably much room for improvement in this part of the business, as all concerned, from the producer to the shipper, do not appear to realise that for the first three months of the year potatoes cannot be handled in the same way as those in late summer and autumn, on account of their immaturity, which means softness and thin skins. Our present knowledge of this disease and its control may be summarised as follows:—

SUMMARY.

1. This disease only affects early export potatoes (Bismarcks).

2. The disease occurs only during the hottest months of the year, namely, January, February, and March.

3. Only tubers which have been mechanically injured in some way become diseased.

4. The commonest injury results from fork stab at digging, but boots and hooks also produce surface injuries.

5. In whatever way injuries are formed, the fungus *Pythium de Baryanum* is able to invade the flesh of such injured tubers, to produce a rapid, watery rot, the invaded flesh becoming darkened in the process.

6. *Pythium de Baryanum* is present in a great number of soils, but is more abundant in those places where it has been the practice to throw rotted tubers back on the land.

7. Unless wounds are present this fungus cannot invade a potato tuber, and no rot is produced on tubers still in the ground, or anywhere else if undamaged.

8. The necessary conditions for this rot to occur are—

A. Damaged tubers—the slightest abrasion to the flesh may become infected.
B. A high temperature.
C. The presence of the soil-dwelling fungus *Pythium de Baryanum*.

If any one of these three is absent, no rot takes place. The second condition, a high temperature, is beyond our control, but the other two do depend upon the methods we employ, thus careless handling tends to an increase of mechanical injury and throwing rotten potatoes on to the land tends to the increase of *Pythium*.

9. During the months of January, February, and March immature potatoes for export *must* be treated from paddock to ship's hold with far greater care than mature potatoes require during the cooler months.

10. Control measures must therefore be along the lines of more careful handling, and more sanitary methods in the disposal of injured tubers on the farm. This means careful lifting in the first place, bagging only undamaged tubers, the proper disposal of all tubers showing any injury, the handling of bags with the least amount of " hooking " possible, and careful storage in the ship's hold.

NOTES ON THE POTATO CROP.

When potatoes follow a grain crop, or imperfect rotational system, the soil, particularly that of a red basaltic nature, is likely to become coarsely granulated and open. Such a condition lends itself to the free entry of the potato moth (*Lita solanella*) and also to the washing of blight spores down to the tubers by rainfall. One of the cheapest and most effective methods of prevention for both insect pest and fungus disease is to mould up the crop a second or even third time, as circumstances demand, and thus create a fine mulch over the surface. In thus closing down the soil interstices much good may be done at little cost, especially in districts where blight may be expected to occur. It is questionable whether the usual 27 inches betwen rows is sufficient to provide a heavy earth mould just in that position to best cover the tubers. Rows more widely spaced would permit late moulding, with a lessened degree of damage to the plants.

Rogueing of stud plots and seed crops should have been carried out before this, but a final checking off and removal of plants, which through some reason have failed to properly develop, should be carried out before maturation makes it difficult to distinguish affected tops.

While some difference of opinion exists amongst Tasmanian growers regarding the value of immature seed, the weight of evidence is in support of its use. Late infection by virus disease may thus be avoided, and undoubtedly a stronger bud and shoot will result during the following spring, especially if proper methods of storage have been employed.

The plants for immature seed stocks should be dug during the earlier stages of yellowing off.

Where it is proposed to sow oats or rape, or a mixture of both, during the early autumn, as a catch crop preceding potatoes next year, the land should be well worked and generously manured. Up to 3 and 4 cwt. per acre of phosphatic manure, or, better still, a mixture of six parts of superphosphate to one part of sulphate of ammonia, applied at the time of seeding, will assist in providing a much improved forage crop for winter grazing. Increased droppings from stock and more organic matter as crop residue will result. The manure will not be wasted, and both catch crop and potatoes must benefit through a good manurial application. With very heavy fertilising, the unexhausted balance of which goes forward for the potato crop, it is advisable to divide the seed grain, or rape, and the manure, and sow in two operations, using half each way across the field.

—*Agronomy Division.*

BRACKEN FERN CONTROL.

By F. W. HICKS, H.D.A., District Agricultural Organiser.

THOUSANDS of acres of our good land are rendered useless by the growth of bracken fern. On many of these areas a great deal of labour has been expended in clearing the virgin bush and establishing grass, which has given way to the invasion of fern, until to-day the land is no more productive than it was in its original natural state.

The writer is of opinion that the two principal causes of this retrogression have been a diminishing soil fertility and the use of unsuitable grass mixtures.

Cultivated plants, such as our better pasture grasses, demand a certain standard of fertility. Without this they are handicapped in the fight for survival with useless plants, which are able to thrive under less favourable conditions. When the bush was first cleared and grass seed sown on the burn, the fertility was generally satisfactory. For a limited period the large amount of ash provided plant food in abundance.

When this food was exhausted conditions became unfavourable to the growth of the better grass species, and they succumbed to the invasion of fern and second growth. It is contended that adequate manuring and the selection of suitable seed mixtures would have helped to prevent this.

A small experiment was initiated by this Department at Scottsdale, with the object of determining if the bracken-infested country could be brought back to grass without ploughing, and at the same time to determine the approximate cost of this work.

In this experiment the grass mixture sown was an experimental one to ascertain which plants would establish, and the main object of the trial was to act as a guide for future work.

The experiment was conducted on rich chocolate land which had gone back to secondary growth, the fern being 6 feet in height.

The methods concentrated upon were:—

(1) Re-grassing.
(2) Frequent cutting of young growth.
(3) Stocking.

The experiment was located on Mr. J. A. Sommerville's property. The first cutting of the fern and secondary growth was done on 17th February. 1928. The area was burnt off on 1st March, and a grass mixture sown as soon as possible in the ash.

The seed mixture sown was as follows:—

5 lb. English Ryegrass.
10½ lb. Cocksfoot.
4 lb. Crested Dogstail.
2 lb. *Poa pratensis.*
4 lb. Chewing's Fescue.
2 lb. White Dutch.
½-lb. *Lotus major.*
2 lb. *Danthonia pilosa.*

Total: 30 lb. per acre, which cost £2.

Obviously this mixture is too costly for general use, but, as previously mentioned, it was sown with the idea of ascertaining which grasses would establish. A very good strike was obtained. The species which ultimately established were English Ryegrass, Cocksfoot, Crested Dogstail, Chewing's Fescue, White Dutch Clover, some *Poa pratensis,* and a little *Danthonia.* The *Lotus major* failed.

MANURING.

Super., at the rate of 1 cwt. per acre, was broadcast with the seed. Sulphate of ammonia was applied at the rate of 1 cwt. per acre, half the quantity being applied on 6th November and the remainder on 4th December, 1928.

Under ordinary circumstances sulphate of ammonia would not have been used, but for experimental purposes, and as a basis for further work, it was included to note its action. The use of the sulphate of ammonia raised the manure costs by 18s. 6d., and on the results obtained its use was not justified.

FERN GROWTH AND CUTTING.

The first growth of ferns which came away after sowing was very heavy. This was cut on 14th April. Further cutting was done on 6th May. 6th November, and 3rd December, 1928. Another cutting was given on 1st February, 1929.

After the first cutting, after seeding, the fern growth became much lighter, and at the time of the February cutting the pasture had thickened up well and the fern growth was very light. In fact, it was so light that its control could then well be included under ordinary farm operations.

The constant cutting of the young growth during the first season is important. The fern stores its food in the underground "root," and by cutting the young shoots before they reach the stage of full leaf the reserve food supply is depleted.

STOCKING.

Cattle were first put on the area on 15th October, 1928, and were grazed whenever the grass growth permitted. Stock can play a very important part in fern-control, provided they are concentrated on the area at the right time. When the young fronds are coming through the ground and still in the "curl" stage, they are tender and easily damaged. Concentration of stock at this period will damage and destroy many of the young fronds.

COST OF THE WORK.

The recorded costs of the work are based on a contract price for the first cut, and all other charges are for the actual cost of labour and materials on a per acre basis. Wages are calculated at 12s. per day. No deductions have been made for grazing of stock.

Cutting—

1st cut (17.2.28) cost 15s. per acre.
2nd cut (14.4.28) cost 4s. 6d. per acre.
3rd cut (16.5.28) cost 3s. per acre.
4th cut (6.11.28) cost 3s. per acre.
5th cut (3.12.28) cost 3s. per acre.
6th cut (1.2.29) cost 2s. 6d. per acre.

Total cutting costs: £1 11s. per acre.

Manuring—

1 cwt. super. per acre (20.3.28)—5s. 10d.
1 cwt. sulphate of ammonia (half on 6.11.28 and remainder 4.12.28)—18s. 6d.

Total manure cost—£1 4s. 4d. per acre.

Seed—Seed mixture as shown above, £2 per acre.

Miscellaneous—Application of seed and manure, 3s. per acre.

Total Costs per Acre—

	£	s.	d.
Cutting	1	11	0
Manure	1	4	4
Seed	2	0	0
Miscellaneous	0	3	0
Total	£4	18	4

CONCLUSION.

1. It is definitely indicated by this work that fern growth can be controlled by this method.

2. As the initial experiment was conducted to act as a basis for future work, and as this caused the costs to be greater than ordinary, modifications can be introduced which will lower costs. The experience gained indicates that a cheaper and equally good pasture mixture can be introduced. On account of its habit of growth, Subterranean Clover should play an important part. Its introduction will mean heavier stocking and a greater suppression of fern growth.

3. The original cutting of the bracken is most effective when done during the month of November. Winter cutting, so largely practised because it falls in a slack period, does not accomplish a great deal. When the winter arrives the fern growth is practically dormant, and reserve food supplies are stored up in the "roots." Little "bleeding" of the plants takes place if cut then, and a good supply of reserve food is ready for the heavy spring growth which results. Cutting during November depletes the food supply by the "bleeding" of the plants, and prevents, to a great extent, the storage of reserve food in the roots.

4. Costs of re-establishing grass on heavily infested fern country can be reduced by avoiding the first cutting, which is

always the most costly. If the fern growth will carry a fire during the early part of March, the seed can be sown in the ash, and the costs considerably reduced.

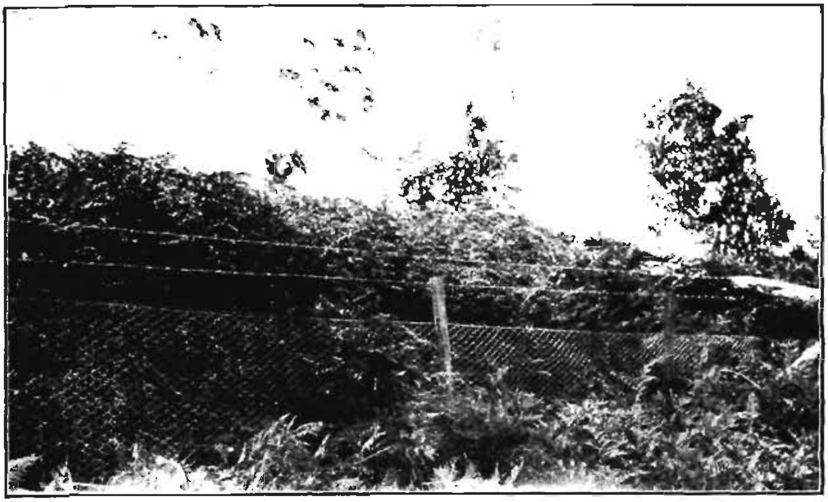


PLATE I. *L. H. Radel. Photo.*
Showing fern growth at the commencement of the Scottsdale experiment.

PLATE II. *L. H. Radel. Photo.*
Fern growth on same area after third cutting. Note good pasture growth.

Progress Report of the Winnaleah Experiment.

The information gained as a result of the first experiment induced the Department to conduct a larger trial on fern-control. The object of this experiment was twofold, viz., to apply the knowledge already gained and to introduce modifications suggested by the first experiment.

Mr. James Le Fevre offered his co-operation and assistance. He placed 6 acres of second-class land at our disposal on which the secondary and fern growth was heavy. See Plates III. and IV., which show the country being worked upon.

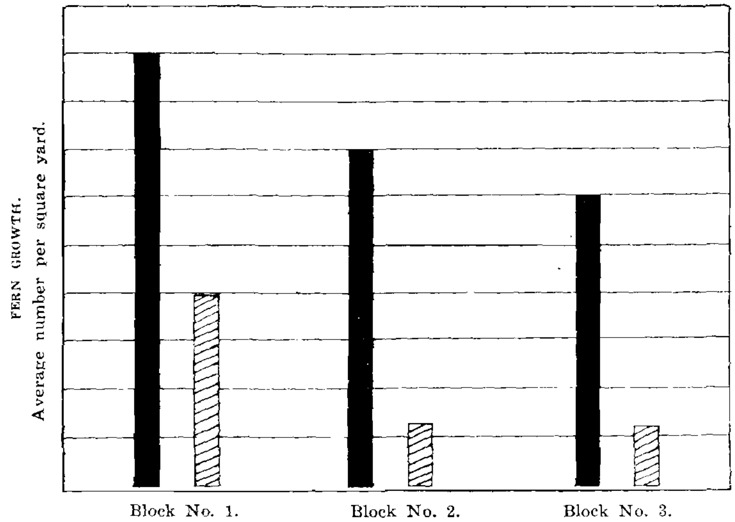
Operation were commenced in 1929. Owing to unavoidable circumstances the ferns were not cut until 8th March, 1929. A wet autumn followed, and it was not possible to obtain a " burn " until later than was desirable. Seeding was delayed, but was done as soon as possible after burning on 15th May, 1929.

Three lots of 2 acres each were marked off, and a different mixture sown on each. The seeding per acre was as follows:—

No. 1 *Block*—
- 1 lb. White Dutch.
- 2 lb. Subterranean.
- 2 lb. English.
- 4 lb. Cocksfoot.

No. 2 *Block*—
- 10 lb. Italian.
- 4 lb. Subterranean.
- 5 lb. Cocksfoot.

No. 3 *Block*—
- 1 bus. Italian.
- 4 lb. Subterranean.
- 5 lb. Cocksfoot.



Black columns represent average number of fern fronds which developed after first cutting.
Shaded columns represent average number of fern fronds which developed after second cutting, nine months later.

Varying quantities of Italian were sown, so that observations could be made as to the different smothering effects. These observations were made possible by the permanent location of sixteen areas in each block, and counting the number of ferns that grew on these areas. Counts have been taken right throughout the experiment, and details can be seen in the accompanying graph.

A good strike of grass and clover was obtained, but the late sowing prevented the clovers from getting a firm hold before heavy frosts were experienced, as a consequence of which most of

the Subterranean was lifted out. This was reseeded in April, 1930, when it was broadcasted with the manure.

CUTTING.

Including the initial cutting, the ferns have been cut three times to date, and cutting has been the same for all the blocks. The costs at actual cutting prices have been—

1st cut (8.3.29)—12s. per acre.
2nd cut (6.11.29)—7s. per acre.
3rd cut (1.1.30)—3s. per acre.
Total cutting costs—£1 2s. per acre.

The fern growth is now much reduced.

PLATE III. *L. H. Radel. Photo.*

Showing type of country being treated. Portion of experiment in foreground after burning off.

PLATE IV. *L. H. Radel. Photo.*

[illegible] Plate III. Shows fern and second growth

MANURING.

Super., at the rate of 1 cwt. per acre, was broadcast with the seed on 17th May, 1929.

Super., at the rate of 1 bag per acre (186 lb.), was broadcast over the whole area on 2nd April, 1930.

Subterranean was added to this super., and broadcasted to replace the Subterranean which had been lifted out by frosts. Subterranean was added at the rate of 2 lb. per acre on Block No. 1, and at 4 lb. per acre on Blocks No. 2 and No. 3.

STOCKING.

Concentrated stocking has not been possible, but the pasture has been grazed when necessary.

COSTS.

The cutting and manuring costs have been the same over the whole area, and have been—

Manuring, 16s. per acre.
Cutting, £1 2s. per acre.

Costs in detail for the various blocks are as follows, and are per acre costs:—

Block No. 1.	£	s.	d.
Cutting	1	2	0
Manuring	0	16	0
Application of two lots of super., at 10d. per acre	0	1	8
Broadcasting seed, at 1s. per acre	0	1	0
Two lb. Subterranean, with super. (2.4.30)	0	5	6
Original seed mixture	0	12	6
Total per acre	£2	18	8

Block No. 2.	£	s.	d.
Cutting	1	2	0
Manure	0	16	0
Application of super.	0	1	8
Broadcasting seed	0	1	0
Four lb. Subterranean (2.4.30)	0	11	0
Original seed mixture	1	0	0
Total per acre	£3	11	8

Block No. 3.

	£	s.	d.
Cutting	1	2	0
Manure	0	16	0
Application of manure	0	1	8
Broadcasting seed	0	1	0
Four lb. Subterranean (2.4.30)	0	11	0
Original seed mixture	1	4	2
Total per acre	£3	15	10

NOTE.—Owing to the failure of the Subterranean in the first case, it is felt that the additional cost for reseeding this is hardly a fair charge. However, as it was an item of expenditure it has been included, but due allowance must be made for it.

Wages have been calculated throughout at 12s. per day. Super. has been charged for at £6 per ton.

The original seed mixtures sown are charged for at cost price, which is as follows:—

Subterranean, 3s. per lb.
White Dutch, 1s. 11d. per lb.
English, 8s. 3d. per bus.
Cocksfoot, 18s. 9d. per bus.
Italian, 6s. 9d. per bus.

The Subterranean which was used for reseeding in April, 1930, cost 2s. 9d. per lb.

CONCLUSION.

It is still too early to make any very definite recommendations as a result of the Winnaleah experiment, but the work done so far shows definite promise. When further time has elapsed, and results warrant it, more information will be published in this Journal.

Some little discussion has been indulged in with regard to the best means of controlling fern, and many people advocate the use of the plough. I do not in any way wish to imply that that method has not anything to commend it. I would state, however, that the use of the plough must be confined to moderately clear country, where the land is flat enough to permit its use. In many cases the costs of clearing the land sufficiently for the plough to enter would be excessive. Again, steep bush country cannot be treated in this manner. The methods adopted in these experiments have been designed primarily for treatment of land that cannot be ploughed.

In conclusion, we desire to thank Mr. J. A. Sommerville and Mr. J. Le Fevre for their co-operation and assistance, without which the work would have been almost impossible.

BRACKEN POISONING.

The common bracken (*Pteris aquilina*) is poisonous for cattle and horses. Large amounts of bracken are commonly eaten by working bullocks with no harmful effects, but the young fronds may cause poisoning.

It appears that the cause of death is really a germ infection, the way for which is paved by eating the fern.

The symptoms are: great depression, staring coat, loss of appetite, congestion of membranes, high temperature, and ultimately unconsciousness, followed by death. There may be a bloodstained discharge from the nose and a bloody diarrhœa.

Treatment is not very hopeful. It consists of giving large doses (1½ to 2 pints) of liquid paraffin—a purgative oil, such as raw linseed oil, is not advisable—twice a day for the first two days, and once a day for the next two or three days. Stimulants, such as whisky or brandy, can be given. The animal may take soft feed, such as milk or gruel, but will probably refuse to eat. It should be kept rugged in a warm, well-ventilated stable or shed. The best treatment consists of careful nursing rather than the administration of drugs. —*Veterinary Division.*

ANSWERS TO ENQUIRIES.

Enquiry.—How close to lambing can I dip my ewes?

Answer.—It is not advisable to dip ewes in lamb. Pregnant ewes must be handled as little as possible at any time, but immersion in a more or less poisonous dipping fluid is a dangerous practice, and considerable losses have frequently occurred by so doing.

—*Veterinary Division.*

Enquiry.—(*a*) If my horse's teeth are defective, what symptoms would be shown.

Answer.—Probably some loss of condition. The food will be improperly masticated, and will be slobbered into the manger. Defective teeth are usually found in old horses. They are usually quite good at three or four years of age, but may want attention from seven years on. Slobbering of feed is frequently due to other causes, such as ulcers in the cheeks or tongue.

Enquiry.—(*b*) What attention would the teeth need?

Answer.—This varies with the conditions found. It usually consists in filing down the sharp inner edges of the lower grinders and the outer edge of the upper grinders. Long teeth may have to be clipped off, or more rarely removed. This, however, is a difficult procedure.

—*Veterinary Division.*

DEHORNING CATTLE.

By N. SJÖGREN, B.V.Sc., Veterinary Officer.

MOST stockowners now realise the value of the removal of horns in cattle, but hesitate to carry out the operation on their own herd, because they have not seen it performed, or because they are afraid of the after-effects. Dehorning is really a simple operation, which every farmer should be able to carry out for himself without any difficulty or untoward results, provided he works cleanly with sterilised instruments. The main advantages of the operation lie in the elimination of injuries due to cows horning one another. These injuries are often of such an extensive nature that they result in a severe check to the milk-supply, and when the injury is in the udder, mammitis, in a form which is very difficult to effectively cure, generally follows.

Damage to fences, shrubs, trees, &c., are other minor but annoying evils which are greatly reduced when a herd is dehorned. If one cow is known to be more destructive than the others, it is not advisable to dehorn her alone, as another cow will soon take her place. The whole herd should be operated on at the same time.

The best time to carry out dehorning is near the completion of the milking period. Recently the Department has been dealing with a case where the cause of deterioration in the quality of cream was found to be due to infection after dehorning, the cows being otherwise perfectly healthy and the quantity of milk quite normal. If the operation had not been done in the "flush" season, it is unlikely that this trouble would have occurred; or, if it had, the loss would not have been so serious. Also, the danger of infection is not so great in autumn, when the weather is cooler and there is less trouble with flies.

PROCEDURE.

It is necessary to have some suitable and convenient method by which each cow can be secured while the operation is being performed. This can be arranged to suit the operator and the conditions on the farm. A cattle-race is quite good for the purpose, provided there is room to work on both sides of the head, which should be prevented from moving up and down too freely. Boards secured above the neck of the cow, or a strong halter tied to one of the posts, will help to control head movement.

A good arrangement is to have two strong posts placed at a suitable distance apart, and two strong pieces of wood fixed securely between, giving a V for the head to rest on. A third piece of wood is then secured across the top of the neck, thus wedging the head into the point of the V. The cross-piece is removed on the completion of each operation, and replaced when another cow is brought in.

Some operators prefer to have each cow tied securely with a strong halter to a single post, and rely on a capable assistant

to hold the head, turning it one way to do one horn, and the opposite way to do the other. Two assistants are generally required—one to hold the head, the other to help manipulate the dehorners.

There are various types of dehorners (the instrument which cuts off the horn) on the market. The instrument must be strong and provided with long handles, so arranged as not to interfere with manipulation when it is opened to its full extent for a big horn. It must also be capable of giving a good, clean cut, so that the horn can be removed with one snap. The instrument should be cleansed in lysol before and after use, and when put away all metal parts should be given a smear of vaseline. It is essential that all movable parts should be well greased before use, and unless this precaution is observed some dehorners, particularly when new, do not open sufficiently to allow the entrance of a large horn.

THE OPERATION.

It must be remembered that dehorning is a surgical operation, and must be treated as such in relation to prevention of infection, treatment of hæmorrhage (if necessary), and subsequent care of the animal. If infection occurs the structure of the skull, with its many cavities, makes the cleaning-up a long and sometimes difficult procedure.

The cavity or sinus extending into the horn is a part of a large sinus in the top of the skull, and this, in turn, is connected with others (the nasal sinuses) lower down. One of the purposes of these sinuses is to warm and purify the air as it passes from the nostrils to the lungs, so that if there is bubbling, caused by the exit of air through a wounded horn during the operation or subsequent treatment, there need be no cause for alarm.

The base of the horn is cleaned, and the lower two or three inches painted with tincture of iodine. The dehorner is then put on the horn about one inch from the base, and enough pressure is applied to the handles to make the cutting edges "bite." When all is ready, and the head still, the cutting edges are closed with a sharp, strong pull on the handles, and the horn falls off. Bleeding is quite extensive at first, but as the blood vessels are small this soon stops. Tincture of iodine is again applied, this time to the bleeding surface as well. The cavity is then packed with one strip of gauze (clean cheese-cloth or muslin which has been previously boiled will serve the purpose) which has been dipped in some disinfectant powder, such as boric acid. If the day is warm and flies prevalent, a little iodoform should be mixed with the boric acid. This pack checks bleeding, and tends to prevent infection.

The following day the gauze pack is removed, the dried blood cleaned off (use disinfectant solution, such as lysol, freely), and the cavity blocked with carbolised vaseline. The wound then heals from the interior of the cavity and under a healthy crust. Some operators use tar; this is not to be recommended, as it does

not stop the hæmorrhage, and only runs down the face, sometimes into the eyes. A mixture of tar and lard may be used as a substitute for carbolised vaseline.

Some farmers regard the leaving of a small stump of horn as unsightly. The horn can, of course, be removed quite close to the skull, but the chances of infection are greater on account of the surrounding hair, while should pus accumulate, and discharge afterwards occur, it is more difficult to treat, as a bandage cannot be applied easily.

If the horns are to be removed right at the base, care must be taken to first cut off all the hair, and then thoroughly clean and dry the surrounding parts before applying the tincture of iodine.

AFTER-TREATMENT.

Usually the animal is not affected in any way, although this depends on the speed and cleanliness with which the operation is carried out. If the wounds become infected, yellow pus accumulates and discharges. This usually occurs about a week after the operation, and although the appearance and health of the animal are normal, there may be a taint in the milk, resulting in a drop in the grade of the cream.

If pus does occur under the crust on the wound, the whole herd should be brought in and treated. The crust should be removed with forceps, and the wound thoroughly cleaned with eusol, namely:—

Boric acid	1 oz.
Chlorinated lime	1 oz.
Water	½-gallon

This is mixed and allowed to stand overnight. The clear solution is poured off and used with equal parts of water.

A piece of gauze dipped in eusol should be placed in the cavity if this has not healed over. This should be done daily until the trouble is cleared up.

Generally, the infection is just on the surface; the secretion from the sinuses protects the more interior parts. Sometimes this clear-coloured secretion overflows through the wound, and although it should be wiped away, it need not cause alarm, and should not be mistaken for pus. It is very similar to a nasal discharge, and is quite often noticed coming from the nostrils a few days after the operation.

A CASE OF AFTER-INFECTION.

In the case which recently came under the notice of the Department, the owner of the cattle which had been dehorned had had his cream graded as "choice" for some time. About three weeks after dehorning, the cream dropped a grade, and after investigation by the Dairy and Veterinary Divisions it was found that the cause was due to an infection of the wounds on the horns.

All cows were dressed and treated, and in nearly every case pus was found under the dry crust. On inquiring into the

case it was found that a man was called in to do the work, and that no precautions were taken to prevent infection, either by disinfecting the instrument before use or sterilising the site of operation with iodine. The cows are now being dressed regularly with eusol, and the wounds are healing satisfactorily.

CALVES.

Information on the dehorning of calves was given in the last issue of this Journal (p. 232).

CREAM COOLERS.

The attention of the Department has been drawn to cases in which satisfactory results from the use of cream coolers have not been forthcoming. The type of cooler was that illustrated on page 240 of the last issue of the Journal. On enquiry being made it was found that the water-bag had been filled only immediately before use, and consequently the water was at ordinary temperatures. The bag should be filled immediately it has been used. This ensures that the water will be chilled in time for the next milking.

Evaporation of moisture from the outer surface of the bag results in lowering the temperature of the contents. For best results the full bag should be hung in a shady, draughty position for a few hours. A draught will speed up the rate of evaporation, and result in the provision of a supply of very cold water.

Applications for ADVERTISING SPACE *in the Tasmanian Journal of Agriculture should be addressed to—*

The Superintendent of Extension Service,
Department of Agriculture,
Launceston.

CREAM AND BUTTER QUALITY.

By J. T. ARMSTRONG, B.Sc. (Agric.), Chief Dairy Officer.

THE most important factor in the development of the dairying industry in this State, and, indeed, the whole of Australia, is the question of the improvement of the quality of our butter. There has been a steady decline in the quality of butter arriving in England from Tasmania for the last five years, and the fall in grade has been more pronounced since the embargo on boric acid as a preservative.

The question has now reached such an acute stage that it will have to be faced resolutely, and more or less drastic steps taken to arrest this steady decline in the value of our export butter.

A lower grade of butter means a lower price per ton, and consequently lower returns to the factory and to the producer.

Inferior cream automatically means inferior butter, and far too much of the cream arriving at the factories in this State is of inferior quality. One factory the writer visited lately was able to grade into "choice" only 15 per cent. of that day's delivery, so that, given ideal conditions of manufacture and no source of contamination in the factory, only 15 per cent. of that firm's output for that day could be graded choicest butter.

If we can improve the quality of our butter so that we can obtain an average of one penny per pound more for it on the London market, it means a difference of £10 per ton, or, taking last year's figures as a standard, more than £27,000 extra to be divided amongst the Tasmanian factories and, subsequently, amongst the Tasmanian dairymen. This average increase should not be hard to obtain, and the first essential is a little more care and attention to the handling of cream on the farms.

Last year butter was graded as soon as it was received at the cool stores. Some of it had not been manufactured for more than 24 hours, and it was found that subsequently much of this butter broke down in storage and developed "off" flavours. It was noticed that much of the trouble occurred within the first few days after manufacture, and this year the Commonwealth authorities have very wisely decided that no butter shall be graded for export until it has been held at ordinary temperatures for at least four days after manufacture.

By that time most of the faults that the butter is liable to develop will be detectable, and the grader will be enabled to assign such butter to its proper grade. Thus, this year, many butters, which in previous years would have gone into choicest grade, will now be put down into first.

This has forced the factory managers to realise that they will have to grade the creams more strictly than has been the case in previous years, and this tightening up in grading is causing great concern to many dairymen, who do not realise the true position. The object in publishing this article is to bring home to the suppliers the fact that the factories are only doing their job when they grade a first-grade cream as first grade and not choicest. They have no option in the matter. A first-grade

cream will not make a "choicest" butter, and if there is the slightest doubt in the grader's mind whether a cream is choicest or first grade, it is his duty to put that cream down into first grade. A can of first-grade cream, tipped into a vat of choicest cream, may lower the whole of that vat to first grade standard.

The factories have realised the seriousness of the position, as was instanced at a meeting of the Associated Factories, to which the Director of Agriculture, the staff of the Dairy Branch, and the Commonwealth grader were invited. A round-table conference was held to discuss the whole position, and to decide what steps should be taken to bring more of our butter up to choicest quality.

The trouble must be looked for in various places—(1) On the farm, (2) in transport, (3) in the factory.

By far the greatest trouble is on the farm, because the farmer has not known, or has not realised, what great care is necessary in dealing with milk and milk products. In handling these articles "near enough" is not good enough. The farmer must aim at a method as close to perfection as is possible if his cream is to arrive at the factory in choice condition. No farmer sends in second-grade cream for preference. He generally does not know what the trouble is, and it was to help him to understand cream taints, their causes and remedies, that an article was written for the last issue of the "Agricultural Journal" by Mr. Sandman, Dairy Officer. If farmers read this article carefully, and put into practice the policy recommended by Mr. Sandman, the factories will not have so much cream to put down into first and second grades. This article has been condensed, and copies forwarded to factories to be placed into the cans of suppliers of inferior grade creams in order to help those suppliers to improve their cream quality.

The policy of the Dairy Branch is to give farmers all the help possible in the remedying of cream faults, but to enable the dairy officers to give the required assistance the wholehearted support of the farmer is necessary. If your cream is graded below choice, don't abuse the grader—he is only doing his job—but ask him what is his opinion of the trouble. He may be able to assist you. If not, get in touch with the Department, or with one of the field officers.

The majority of faults can be located quite readily, but some require time to pick up, and on his first visit the dairy officer may not get to the bottom of the trouble, and the cream will still be inferior in grade.

Some farmers are then apt to blame the officer and question his ability; but this does not assist. A further request for assistance should be made, and on his return visit the officer will most probably be able to pick up the trouble. Farmers are asked to give all the facts to the visiting officers. These men are there to help, and they cannot do so if the farmer suppresses some essential facts. The writer has personal knowledge of cases where it was thought an unwashed separator was the cause of inferior cream. A visit paid to the farm in the morning showed the separator was clean, and the writer was assured by the farmer that the machine was washed twice a day. A subsequent

visit in the evening proved that this was not the case. In the evening the separator was not taken apart and washed thoroughly, and this was the cause of the low grade of the farmer's cream.

It is not possible to help a man who either gives wrong information or suppresses information in regard to his usual procedure in handling his cream. If full information is supplied to the visiting dairy officer, farmers can be assured that the officer will be able to help them, but not otherwise. The method of handling cream in transport is receiving attention.

The next source of trouble is contamination in the factory and faulty technique in manufacture. That the directors of factories and their managers are alive to their responsibilities was clearly shown at the meeting referred to previously, and suppliers can rest assured that "choice" cream received at the factory will be so handled that it will be turned out as "choice" butter. An officer of the Dairy Branch will be continuously visiting the factories to grade the cream, and to give advice to factory managers on technique in manufacture. The aim of the Department is to help the factory by advice to farmers on how to secure choice-grade cream, and to help the farmer by ensuring that his choice cream will be manufactured into a choice-grade butter by checking the grading at the factory and by careful inspection of factory hygiene and technique.

To enable this State to raise the standard of its export butter, all three parties—the Department of Agriculture, the factory managers, and the cream suppliers—will have to do their part, and each can only do his share of the work in grading up if he has the wholehearted support and co-operation of the other parties.

The Commonwealth grader has always been only too willing to help by giving advice on the quality of the butter and the faults which the butter has developed subsequent to manufacture, and again this year Mr. Ramskill has signified his willingness to assist in improving our butter quality. With the low price being paid for even choicest grade butter, the position is critical, and every effort must be made by all associated with the production and handling of milk, cream, and butter to improve their methods so that this year, instead of seeing our butter quality decline, as it has been doing in the past, an upward movement will be recorded, and the name of Tasmanian butter in London will be synonymous with choice-grade butter.

The future of the industry depends on an ever increasing supply of choice creams to factories and a decreasing supply of creams of inferior grades. In this respect the success of the dairying industry depends largely on the farmers themselves.

GRADING OF APPLES AND PEARS.

By P. H. THOMAS, Chief Horticulturist.

ALTHOUGH the grades adopted for the Tasmanian export trade have been in vogue for a number of years, it is evident that many growers do not appreciate their value when applied to the apple and pear crop.

Under such circumstances, and as the export season is approaching, it is opportune to briefly review the existing grades, and explain their requirements in language as simple as possible.

SPECIAL.—This, as the name implies, is the grade intended for the *full-coloured and well-developed fruits* which many orchards produce in a normal season. Slight blemishes are permissible to the extent of five per centum of the contents of a case, but it must be understood that such percentage is only to allow for human error in the general packing operations, and *the objective is a case of clean, well-coloured, unblemished fruit, the minimum size being $2\frac{1}{4}$ in.* Growers who produce "special fruit" should brand it as such, and not, as often happens, write down the real quality by designating it as a lower grade.

STANDARD.—This is again a grade that is intended for *clean, unblemished fruit,* the difference between it and "special" being represented principally in the colour requirements, and fruits of only medium colour should be packed under this designation. In this grade a 10 per cent. tolerance of blemishes is allowable, with a maximum aggregate of a $\frac{1}{4}$-inch diameter on each fruit. Here, again, *the objective should be a case of sound, clean fruit,* the percentage of blemish being permitted to cover any unavoidable errors in packing. Skin russeting is permitted in this grade, and, whilst the minimum size is $2\frac{1}{4}$-inch, all pears and normally small varieties of apples, such as Crofton, Fameuse (Pomme de Neige), King Pippin, Cox's Orange Pippin, Nickajack, and Yates, can be packed down to 2 in., as long as they are free of black spot.

PLAIN.—This grade is intended for *sound, good, marketable fruit that is slightly blemished,* and all apples and pears affected by black spot fungus should be confined to this "Plain" grade. The maximum amount of black spot allowed on any one fruit ($\frac{1}{2}$-inch diameter in the aggregate) is delineated on the charts published by the Department of Agriculture, and if the grade is kept rigorously within this allowance and the other provisions as to the size (minimum, 2-inch diameter) and quality, a good marketable line of fruit should be available.

A close attention to these details and a uniform classification of the fruit exported by growers and packing-sheds will materially improve the export trade, and also provide a practicable basis for contracts and purchases upon which buyers and sellers can deal with mutual confidence and understanding.

FOOT-ROT, OR "TAKE-ALL," OF PEAS.

By W. J. DOWSON, M.A., D.Sc., Plant Pathologist.

FOR several years the pea crops of this State have suffered loss through a stunting and root-rotting agency, the effects of which have given rise to the common name of "take-all," and in some districts to "drowning." The latter name refers to the fact that the disease is more common on low-lying land apt to become water-logged. So serious did the losses become that in 1926 the Department of Agriculture sought the aid of the Commonwealth's Council for Scientific and Industrial Research, which made the necessary arrangements to enable Dr. Ethel McLennan, of the Melbourne University, to investigate the trouble both in the field in Tasmania and in the laboratory at Melbourne. Into the causes of this disease Dr. McLennan made a very complete investigation during 1926-27, but was unable to finish certain experiments regarding the possibility of controlling the disease in the field. The arrival of the writer, in the spring of 1928, made it possible to carry on this work in co-operation with Mr. C. E. W. Oldaker, who had previously assisted Dr. McLennan in her investigations. Since 1928 further investigation has not only confirmed the nature of the disease, as disclosed by Dr. McLennan, but has also shown the practical impossibility of ridding infected soils of the parasitic fungus responsible for the disease.

The same disease has recently made its appearance in Europe, and has been known for some years in the United States, where it was also fully investigated in 1925. From these records it would appear that the disease occurs wherever peas are extensively grown.

The symptoms are so well known and are so severe that a lengthy description of them is rendered unnecessary. Stated very briefly, the plants are stunted and discoloured, the general appearance being purplish-red, they are easily pulled out of the ground, and the roots are few and blackened. The disease occurs in large patches, and may appear when the peas are only a few inches high, or sometimes very much later. The first sign of anything abnormal usually follows heavy rain, and is more common on heavy soils, though the disease will appear on any soil if it be low-lying or subject to seepage.

The disease seems to be unknown on new land sown to peas for the first time, but, once having appeared in patches, the infected areas increase each time a pea crop is sown, no matter whether the interval between crops be two or six years. After the fifth sowing the disease increases to such an extent as to render further crops unprofitable.

The actual rotting of the roots is not due to "drowning," but to the invasion of a fungus called *Aphanomyces auteiches*,

For the avoidance of this disease the following recommendations may be offered to growers in Tasmania:—

1. Avoid growing peas on very heavy land.

2. Avoid also any situation which is low-lying and apt to be water-logged, or in which there is much seepage.

3. Sow early rather than late, so as to give the plants a good start before conditions become favourable for the attack of *Aphanomyces.*

4. For a pea crop apply a mixture of 10 cwt. of air-slaked lime or ground limestone with 2 cwt. of superphosphate in winter or very early spring.

5. Practice a five-year rotation between pea crops.

6. Endeavour to drain properly, with tiles and ditches, all low-lying land.

It seems highly probable that if the last recommendation were carried out over land now infected with *Aphanomyces* in this State, and followed up with liming, peas would enter far more into rotations than is possible under existing conditions.

CONTROL OF SMUT IN OATS.

OF the two kinds of oat smut in Tasmania, the one known as loose smut is by far the commoner.

The prevention of these two diseases is the same, and consists of treating the seed with formalin, which kills the smut spores with but little injury to the seed. The method is as follows:—

The grain is spread out on a clean floor or on a tarpaulin, and is sprinkled with a solution of formalin, made by adding 1 pint of the commercial liquid to 40 gallons of water (or ½ fluid oz. of formalin per gallon). The sprinkling is best performed by a watering-can, and while this is being done the grain is turned over by shovels, so that the whole mass of grain is just wetted, and no more. About 1½ gallon of the formalin solution will be required for each sack of grain.

The wetted mass of grain is then covered over with bags moistened with the same liquid, and left for four hours, after which the bags are removed and the grain is spread out to partially dry. It must not be allowed to dry out completely or the germination will be seriously affected, but the drying should be just sufficient to allow the seed, though swollen, to pass through the drill. This means that the grain must be treated with the formalin just prior to sowing, i.e., the evening before. The following morning it will be sufficiently dry to sow. —*Plant Pathologist.*

a member of a group of fungi which flourish in moist situations. The root nodules are always heavily infected, the lateral roots and main root are invaded later, and finally the fungus grows up into the collar of the plant. In the decayed roots *Aphanomyces* forms numerous thick-walled resistant spores, which enable the fungus to withstand considerable drought and to remain dormant in the soil for a number of years. Ten years have been known to elapse between two diseased crops on the same land. After heavy rains in spring or early summer, when the soil temperature is rising, some of these dormant spores germinate, and will infect any pea roots in the vicinity. No other plant can be infected, and the disease can only be contracted from contaminated soil. It is not seed-borne, but contaminated soil may be readily conveyed from place to place on farm implements, boots, and possibly on the feet of birds. If the conditions are favourable, that is, if the soil contains sufficient moisture and is relatively warm, the spores will germinate in practically any situation.

All the experiments tried, either in Tasmania or elsewhere, to find a practical disinfectant of the soil failed to control the disease in the field, although in pot experiments in the glasshouse in Australia a partial control was obtained by either sterilising the soil by heat or by soaking the seeds in malachite green.

A carefully conducted experiment, carried out by Dr. McLennan and Mr. Oldaker, to endeavour to sterilise a field-plot by burning a thick layer of straw and bracken over it, proved unsuccessful, and field experiments with the malachite green solutions had no better result; in fact, blue peas soaked in this solution failed to germinate.

Amongst other things tried was the effect of lime, as it was already known that some of the soils on which the disease appeared were deficient in lime to the extent of 2 tons to the acre. Accordingly, liming was carried out for two seasons, the first being in 1927 and the second in 1929, at the rate of 2 and 4 tons to the acre. In addition superphosphate and potash were also added separately and together on portions of the heavily limed area. Although the disease again made its appearance in severe form when these plots were again sown in 1929, the plants which escaped infection were very much better on all the limed plots, and best of all on that receiving the two artificials. On an adjacent paddock, not so subject to foot-rot, a half-ton dressing of lime had been applied in 1927, and the next crop of peas, sown in 1929, was much superior to that on another part of the same paddock which had not received any lime.

As indicated above, the American investigators were as unsuccessful as those in Tasmania at finding any adequate field control of the disease, and attention has now been directed to the possibility of discovering resistant strains.

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ANSWERS TO ENQUIRIES.

Enquiry.—Two years ago I worked several apple-trees over by the refurnishing system, with good results, except that growth from the original stock is troublesome. The young shoots have been rubbed off repeatedly, but they still persist. What do you advise?

Answer.—Wait until the shoots have attained a length of 4 or 5 inches, and then pull them out. Those which come out with the "heel" attached will give no further trouble.

—*Horticultural Division.*

Enquiry.—My orchard requires green-manuring, but a late sowing is not a success in this district. If sown in late February, would the young green crop be damaged greatly by the harvesting of the fruit crop?

Answer.—The tramping and carting that are necessary in the gathering of the fruit would to a great extent destroy the green crop as it germinated. Why not sow every other land, when, with reasonable care, little tramping and no carting need be done on the cropped lands?

—*Horticultural Division.*

Enquiry.—It is my aim to further improve my seed potatoes. They have been yielding from 8 to 12 tons during the last few years. Can I expect to improve them by selection? What is the best method to adopt?

Answer.—It is certain that considerable improvement can result by selection, and much can be done by all growers of seed potatoes.

Careful inspection will probably show that there are a number of weak plants and some obviously diseased ones present. It would be advisable to dig these out as early as possible. This will not be expensive, because the yield from these plants would be extremely small, and their destruction would prevent any diseases which they carry from being passed on to the healthier plants. It is considered that of all diseases, the viruses are responsible for the greatest reduction in yield, and once a plant is infected there is no known method of treating it.

The extent to which the destruction of weak plants can be relied upon to improve the crop depends upon the virus and other diseases present, and what carriers exist in the locality.

At digging time tuber-selection should be practised, and any small-yielding roots discarded. From a seed-grower's point of view, strict attention should be paid to the tuber type, and only the large tubers of good shape and type used for the seed plot. These can be cut into good, blocky sets when planting. It may not be out of place to remind you that the treatment of the crop must be thorough in all its phases. Some essentials are:—

(1) Good storage to prevent excessive sprouting, and yet have the potatoes safe from sprout infection by aphides during the "greening" process. It is advisable to dip seed to reduce fungus diseases.

(2) Careful selection of the ground for the potatoes, with due regard to isolation, and at least a four-year rotation.

(3) Careful preparation of the ground, with provision for plenty of humus by ploughing in greenstuff or its equivalent.

(4) Accurate planting and adequate manuring to ensure a good stand. The practice of allowing one horse to walk on the sets is not conducive to an even stand.

(5) Plenty of cultivation and thorough moulding of the potatoes, with a view to keeping down weeds and safeguarding the plants against fungus diseases.

Other methods of selection are being tried, but their value has not yet been widely demonstrated.

The Tasmanian

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ERADICATION OF CALIFORNIAN THISTLE.

(Cirsium arvense.)

By C. A. HOLLAND, Dip. Agr., A.U.C.R., District Agricultural Organiser.

THE Californian Thistle, which is sometimes called the Canadian Thistle (or Creeping Thistle), and is best known in many districts as the " Cali " or " Yankee," is a native of Europe, and is reported to have first appeared in Tasmania at Cambridge, the seed having been brought in as an impurity in some oats imported from California. At the present time it is occupying many hundreds of acres of good arable land in the southern part of this State, and although a certain amount of sheep feed is obtained from it in the flowering stage, the land on which it is at present growing is capable of far greater productivity if freed from this pest.

The plant is a perennial, with a creeping underground stem, running horizontally under the ground, and giving off roots and leafy stems at intervals. In free soils the roots will penetrate many feet below the surface of the soil.

Several methods of eradication are fairly successful for small patches, salting being the most common, though this has the great disadvantage of rendering the soil infertile for a considerable period, and is impracticable on large areas.

Where the infested land is capable of growing lucerne the weed can be controlled if the lucerne is continually cut, as after each cutting the lucerne will reshoot much quicker than the thistle, which will eventually become exhausted. This method is only applicable on certain types of country, and the only method of eradication known to be completely successful on arable land at the present time is summer fallowing and continually " shaving " a paddock, so that the thistles are prevented from coming to the surface for a whole growing season. The area to be treated should be marked out in the autumn (as this thistle is dormant during the winter), and ploughed to a depth of about 5 inches in the early spring. During the following fortnight the land should be worked into a fine tilth, so that a " shaver " or " duckfoot " hoe can be operated at a depth of about 3 inches below the surface.

" Shaving " must then be carried out at regular intervals of not more two weeks until the autumn, so that the shoots,

which are continually being sent up from the underground stems, will be prevented from reaching the surface. By this means the underground stems will ultimately become almost exhausted, leaving only a few weak shoots, which can easily be dealt with in the following spring.

This method is not without its difficulties, for should the season prove to be wet it would be impracticable to continue the "shaving" at regular intervals, and once the shoots have reached the light they will very soon replenish the underground stems and greatly retard the work. Many farmers have attempted this method of eradication, and condemned it solely because they have been unable to continue the shaving at regular intervals or have neglected the few weak thistles which have appeared the following spring.

A valuable demonstration of the success of the method has been given by Mr. Edwin Morrisby on his property, "Baskerville," at Old Beach, where he has exterminated in all about 30 acres of this pest. When he bought this property there were about 5 acres of "cali" in each 30 acres of cultivation, and each year Mr. Morrisby treated a fresh patch, with the result that at the present time there are no thistles to be found in these paddocks. This farmer commenced the work without previous experience or any assistance, but with a firm determination to master the weed. He attributes his success to the fact that he did not allow any plants to reach the surface once the "shaving" had commenced, and was also very careful to follow up the few isolated thistles which appeared the following spring.

PROGRESS REPORT ON EXPERIMENTS WITH SODIUM CHLORATE.

While we have definite proof that this weed can be eradicated by "shaving," there are many arable farms at the present time which are almost completely covered with the pest, and as only a small portion could be treated by the "shaver" each year, the task has become almost impossible.

Following on the success obtained in the north-east with sodium chlorate on ragwort, the writer decided to try out the effect of this chemical on the Californian thistle, and is conducting experiments on the properties of Mr. E. E. Firth, Pawleena, and Col. A. C. Blacklow, Orielton. The sodium chlorate is being used in a 7½ per cent. solution, for at this strength it does not damage grass.

Further details with reference to this chemical will be found on page 158 of Vol. I., No. 4, of "The Journal of Agriculture."

Four plots were taken, representing various stages of growth of this thistle:—

Plot No. 1.—Small suckers just appearing through the ground after ploughing.

Plot No. 2.—Thistles about 12 inches in height.

Plot No. 3.—Fully-grown thistles just coming into bud.

Plot No. 4.—Fully-grown thistles in full flower.

On 29th December, 1930, all plots were sprayed at the rate of 50 gallons of the solution per acre, and within a day or two it was observed that the tops were completely dead on Plot 4, where the thistles were in full flower, whereas the effect was not so severe on the other plots, particularly No. 1, which was only slightly browned.

Inspection three weeks later showed that Plot No. 1 had not been sufficiently damaged to arrest the growth of the plants, whereas the mature shoots in the other plots had completely dried up. Examination of the roots showed that they had commenced to rot, and two weeks later the roots had rotted to a depth of 12 inches below the surface.

In the meantime weak suckers had commenced to appear on all plots, so Plot No. 4 was subdivided, and a second spray applied to one half on the 29th January. The other half was left to be treated with a second application when the suckers matured, but they had not done so by the middle of March, and as the dormant season is now commencing at time of going to press, it is unlikely that further growth will be made this season.

The section of Plot No. 4 which received the double spray is at present showing a very few weak suckers.

Owing to the habit of growth of the plant, it will not be possible to make further observations before next spring, and while at the present stage it is by no means possible to report that this trial method of eradication will be successful, the results to date are certainly very promising.

The cost of material for a single spraying as applied to these plots is 12s. 6d. per acre.

In conjunction with these trials the effect of sodium chlorate is being tried out on blackberries, bracken fern, briars, and silver wattles. The results will be published when available.

The thanks of the writer are due to Mr. E. E. Firth and Col. A. C. Blacklow for their assistance and co-operation in this work.

A pure stand of clover is not an ideal diet for stock. Grasses should also be provided. Grass-seed can be introduced into " sub " paddocks when these are harrowed in March.

THE MANAGEMENT OF CLOVER.

By C. L. GILLIES, Dip. C.A.C., B.Agr., Chief Agronomist.

IT is evident from comment in the press and from statements by individual farmers that some difficulties are being experienced in making satisfactory use of the clover crop. These notes are intended to clear up some wrong ideas regarding clover and its effects, and to offer suggestions for getting rid of some of the difficulties.

First, let it be stated quite definitely that the continuance of the campaign to " Grow More Clover " is vital to improvement of soils, crop yields, and stock in Tasmania.

There is ample evidence to support this view. and there are many examples from all districts of the effectiveness of clover. It is therefore important that farmers should continue to have confidence in clover and continue to grow it. To that end, these notes are offered to clear away any doubts and difficulties or wrong ideas which may be current about clover.

Bloat.—Cud-chewing animals have a special kind of stomach arrangement to deal with their food. There are four different compartments. In the first three the food, like straw or hay, is softened with moisture and ground up so that the food substances in them can be digested easily in other parts of the food canal. However, in these first three compartments germs are also present which ferment plant material, producing heat, food substances, and gas. The gas is a waste substance, and has to be got rid of.

When fresh, easily fermented forage, such as clover, lucerne, rape, or young grass, is eaten, especially in quantity, the germs may make so much gas that the animal bloats—it cannot get rid of the gas.

Prevention of bloat, then, is a matter of preventing the animal from getting too large a quantity of this easily fermented material in its stomach.

In practice the following points should be observed:—

(1) Sheep or cattle should not be turned on to clover pasture for the first time while they are hungry, or if the clover, through being moist, is in a specially easy state to ferment.

(2) To take the edge off their appetities, dry forage (hay or straw, or even chaff) should be fed to stock first before going on to clover.

(3) The provision of feed-racks with dry forage is advisable in all pastures and in the rape crop, so that stock can help themselves.

(4) For chronic "gorgers" or chronic " bloaters " a stick placed in the animal's mouth, and tied with a string to the back of the head, will prevent greedy feeding, and will encourage belching out of the gas.

(5) If one keeps in mind that the cause of "bloat" is too big a quantity of easily fermented forage, then management must be used to prevent it. As with cattle, to put sheep on clover whole time without gradually getting them used to it is to make a certainty of "blowing" many of the stock.

A shower of rain on a sultry day may turn a harmless clover pasture into a mass of easily fermentable material. A wise farmer would remove his stock for a period from such a paddock until the danger was past.

Clover Taint.—Clovers, like many other plants, contain an oil which gives the clover a characteristic flavour. This oil may be present in the milk of animals. The shorter the time between feeding on clover and the milking the greater amount of flavour present. One can reduce the amount of the oil by taking stock off clover some time before milking. This gives a chance for the oil to go off as a vapour out of the animal's body.

Aeration of the cream or milk, with subsequent cooling of it, will remove a great deal, and the final processing in the factory can remove any remaining traces of the clover oil.

The feeding of clovers, therefore, need not affect the final or keeping quality of butter, as many people believe it does. Unfortunately, clover is wrongly blamed for taints in milk and cream, taints caused by germs of various kinds associated usually with the animal's dung. These germs give rise to flavours and taints which are wholly of germ origin, and which may increase during the holding of cream or butter.

Many farmers who feed their cows extensively on clover can produce choice cream. It can be done if strict attention is given to the points of management given above and absolutely thorough germ-cleansing of all utensils is undertaken.

After all, clover is no magic crop, which will do away with intelligent management. Rather, it calls for skilful handling of crop and stock.

The ideal health-promoting food is a mixture of good grasses and clovers. This is also the ideal from the viewpoint of production and carrying capacity, so that the matter of health-promoting food becomes incidental to the question of increased soil fertility and pasture improvement.

THE LIVER FLUKE AND DISEASES ASSOCIATED WITH IT.

By T. PHILP, L.V.Sc., Chief Veterinary Officer.

RECENT research has emphasised the importance of liver fluke, and the necessity for further investigational and control work if losses occasioned by this parasite are to be minimised. The economic loss attributed directly or indirectly to this small leaf-like worm must cost many individual owners hundreds of pounds annually in our own State. Most sheepowners are familiar with the effects of mature fluke, but only as the result of work undertaken within the last few years is it now recognised that acute fluke and black disease are responsible for far more deaths in sheep than is chronic fluke disease.

Very briefly the parasite and its effects will be dealt with.

THE PARASITE AND ITS LIFE HISTORY.

Belonging to the order of flat worms, the adult fluke is a small leaf-like object, varying in size from ½ to 1 inch in length. It is greyish and yellowish-green in colour, and contains male and female organs in the one individual. The mature fluke lays thousands of eggs, which are passed out of the bile ducts of the liver into the intestine, where they are mixed with its contents, and finally passed out with the dung of the animal.

Favourable conditions for the further development are the presence of the small fresh-water snails and shallow water. Unless the eggs on leaving the sheep encounter moist conditions they shrivel up and die. On reaching the water they rapidly develop into small embryo flukes, which burst the egg-cover and swim about until they meet a certain type of fresh-water snail. At this stage, if they do not meet the right kind of snail, within an hour or two after escaping from the egg they perish.

On reaching the snail, the fluke bores into its body, and undergoes a further series of remarkable changes, which result in the original fluke dividing up into over one hundred immature flukes, called "cerceriæ." These immature flukes escape from the body of the snail, swim about in the water, and attach themselves to blades of grass or weeds, whence they are taken up by the sheep. In this condition they are encased by a hard covering, and are known as encysted cerceriæ. They also may become encysted in the snail, and in this state, if the snail is swallowed, the sheep would be likely to become fluke-infected. On being taken up by the sheep, the covering surrounding the immature fluke dissolves, the fluke bores its way through the stomach-wall, and ultimately reaches the surface of the liver, which it pierces. In the liver the immature flukes wander until they reach the bile ducts, where they become mature and lay their eggs.

In many instances, the amount of tissue damage which the liver sustains by the passage of immature fluke through its substance is remarkable, and this damage is of great significance in both acute fluke and black disease.

Reference has been made to the necessity of the presence of one particular type of snail in order that the fluke may attain its maturity. This snail is found in oozy banks and in water not much deeper than 2 inches. Marshes, the backwaters of rivers, and shallow, rocky pools are favourable locations. The snail itself varies in size from a grain of wheat to a pea. It

WHERE TO ATTACK FLUKE.

1. To Cure Sheep. (By itself this measure will not eradicate Fluke.)
2. To Kill Snails. (If all snails are killed Fluke disease cannot occur.)

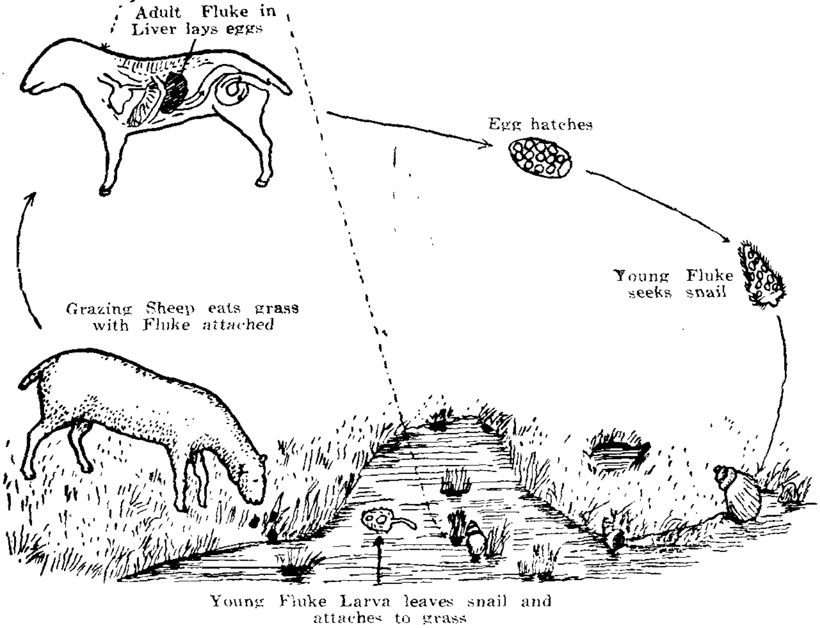

FIG. 1.

Diagram illustrating the life-cycle of the Liver Fluke and showing how fluke disease may be controlled.

[Reproduced by courtesy of Dr. T. Clunies Ross.]

differs from the garden snail in size, and also in shape, which is conical. Those snails with the clockwise spiral, when viewed with the apex towards the observer, are of a dangerous type. Persons who are doubtful as to the type of snails on their property may send specimens in damp grass to the Veterinary Laboratory, Launceston, for identification.

Swamps and backwaters of rivers, into which sheep gradually work as these begin to dry up, are fertile sources of infection. The Tasmanian snail has been identified as being identical with the snail host of liver fluke in New South Wales.

ACUTE FLUKE.

Acute fluke disease is the name given to the condition occasioned by the invasion into the liver substance of a number of small flukes which cause destruction of liver tissue, causing the liver to become inflamed and hæmorrhages to occur. The liver functions are disturbed, and there exists a condition

of toxæmia, or poisoning, arising both from the poison excreted by the flukes themselves, and from those poisons which are absorbed into the system as a result of disturbed liver functions. There is a possibility also that the bacteria gaining entrance through punctures made by the immature fluke may play a part in the incidence of acute fluke disease. This is a possibility which is worthy of more attention by investigators. Death from acute fluke may be very rapid, the animal dying without showing any premonitory symptoms. Death from black disease and acute fluke are usually attributed to "Cumberland," which in the mind of the stockowner is the general diagnosis of the condition of all sheep which die suddenly and undergo rapid putrefaction. Generalities such as these, however, serve no good purpose in veterinary investigation, and before remedial or preventive measures can be offered exact causes must be ascertained.

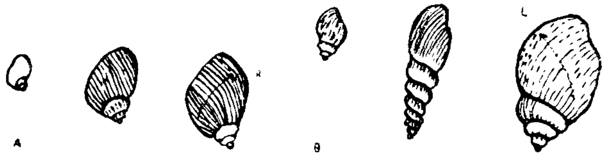

FIG. II.—COMMON FRESH-WATER SNAILS. (Natural size.)

A—Fluke snails (*Limnea brazieri*). These may be distinguished by the fact that, when placed face downwards on the palm of the hand, with the point of the shell towards the observer, the final coil of the shell curves to the right. Young fluke must undergo development within these snails, so that without them fluke disease could not occur.

B—Snails not known to be carriers of fluke. The final coil of the shell curves to the left.

[Reproduced by courtesy of Dr. T. Clunies Ross.]

Acute fluke presents particular difficulties in differentiating it from black disease and other diseases, and in the majority of these cases bacteriological laboratory examinations are essential to a correct diagnosis; therefore, in order to obtain the best results, treatment of these different conditions should be applied only after veterinary investigation.

A general post-mortem picture of death from acute fluke shows punctures, hæmorrhages, fibrous roughenings on the surface of the liver, fibrous tracks in its substance, and accumulation of fluid in the abdominal cavity and around the heart. Several of these conditions are, however, consistent with death from black disease and other bacterial disease, hence the need for an accurate diagnosis. If the existing factors operating are such as lead to the maturation of the fluke and their further development in the bile ducts, the condition may lead to what is known as chronic fluke infestation.

CHRONIC FLUKE.

This is a condition in which the fluke attains maturity in the bile ducts.

In the first instance, as the result of their presence, the liver is stimulated to activity, and shortly after the flukes reach

the bile ducts sheep often improve in condition. Not for long, however, is this happy condition maintained; for soon the liver becomes permanently changed as the result of the irritation; the bile ducts become thickened; the flow of bile is obstructed; and digestive disturbances occur. These conditions, coupled with the drain on the system by the fluke, which is a blood-sucker, lead to chronic anæmia and wasting. The membranes of the eyes and mouth are pale, and dropsical swellings appear under the jaws and abdomen. In this condition the animal may live for three or four months, death taking place eventually from exhaustion and anæmia. The duration of the fluke in the bile ducts is variable, but the average period is about two or three months, although fluke has been known to persist for over 12 months. Though these parasites may attain maturity and be passed out of the liver, the damage that they have done is permanent. Carcases of sheep dying from chronic fluke show a fibrous liver, thickened bile ducts, and dropsy of the abdomen. The bowels are pale and watery and thin walled, and there are all the evidences of a wasted and anæmic system.

BLACK DISEASE.

An article on black disease by the Veterinary Pathologist (Mr. Oxer) has already appeared in the Journal (1st May, 1930), so it will suffice to deal briefly with the influence of fluke in connection therewith. Black disease is a disease of sheep caused by a particular germ, and characterised by a change in the liver and the formation by this germ of a very potent poison, which kills the sheep in the majority of cases before they have time to show any symptoms. Investigators of black disease have concluded that sheep on pastures which have been infected by black disease are continually taking up in their food the spores or seeds of the disease, and under ordinary circumstances are none the worse for them. When, however, the liver becomes injured, as is the case when the small fluke makes a puncture, hæmorrhage and small areas of inflammation—suitable conditions for the growth of the black disease germs—are created, and with the elaboration into the system of the poisonous products of these germs the animal dies rapidly.

Thus for the development of black disease two factors are essential: first the presence of the particular germ in the liver of the animal, and secondly the presence of the immature liver fluke.

TREATMENT.

In discussing the treatment for fluke it must be clearly understood that no form of treatment is effective against immature fluke, but only against those which have reached the bile ducts. The classical treatment is by the use of carbon tetrachloride, which is marketed under numerous names, and in some instances is of doubtful degrees of purity.

It is given in liquid and capsule form, and it is generally considered that, in addition to being cheaper, the liquid form is the more convenient to administer. Care should be taken that

the drug is of the best quality, as inferior carbon tetrachloride may have harmful effects on the animal.

The drug is best administered mixed with liquid paraffin. in the proportion of one part of carbon tetrachloride to four parts of paraffin; the dose of this mixture being five cubic centimetres. No advantage is obtained by increasing the dose; in fact, in certain circumstances harm may accrue from overdosing. The drug is wholly effective, and it has the advantage of obviating the necessity of keeping the animal from food and water before and after treatment.

Syringes holding the exact amount of the dose may be obtained at most chemists. The cost of each treatment should not exceed ½d.

Strangely enough, two contrary conditions may produce ill-effects on sheep treated with carbon tetrachloride. One condition is when sheep have been fed concentrates, and the other is when sheep are suffering from calcium deficiency. Concentrates should be withheld a week before treatment, and in cases where deficiency is suspected, this should be the subject of veterinary investigation before treatment is attempted.

It would appear from Tasmanian experience that it is necessary to start carbon tetrachloride treatment earlier than is done in New South Wales, as adult flukes have been found in the livers of Tasmanian sheep in January. It is therefore advisable on affected pastures to drench the sheep every month or two months from January to May, followed by a check-drench in July.

Prevention of Fluke Infestation.

The prevention of fluke presents great difficulties, and in Tasmania, with its rivers so subject to floods, bluestoning of the pastures and standing water is a proposition presenting a not very practicable line of attack. However, on properties which possess swamps, oozy banks, and waterholes, myriads of snails may be destroyed by the application of bluestone, as a solution of 1 to 2,000,000 will kill snails, but will have no harmful effect on the stock. The presence of weeds and dissolved organic matter in the water, however, greatly minimises the effect of bluestone.

Two methods of bluestoning are employed. One is to place pieces of bluestone at the head of drains and small watercourses, or in swamp and waterholes, or to drag a bag of bluestone through such places until the water is slightly coloured.

The second method, which is applicable to damp pastures or those covered with shallow water, is the broadcasting of one part of bluestone mixed with four parts of sand, at the rate of 150 lb. of the mixture to the acre.

Care should be taken that the bluestone is finely ground, and only the blue crystals should be used; pieces that have turned white should be discarded. A knowledge of local conditions is necessary in order to advise on the best mode of attack, both as regards the snail host and other phases of fluke disease.

Bluestoning is best done in the summer and autumn, as the snail has two breeding seasons a year, and December and June

are suggested as suitable months for this operation on places where it is likely to be effective. Bluestone applications by broadcasting are most effective when done just before light rain.

Drainage plays an important part in fluke-prevention, and, when practicable, springs, oozy banks, and swampy areas should be drained, and all drains should be kept open and free of water weeds, as the latter are favourable locations for the snail. Where possible, sheep should be watered from deep instead of shallow pools, as the snails are not found in water much over 2 inches deep.

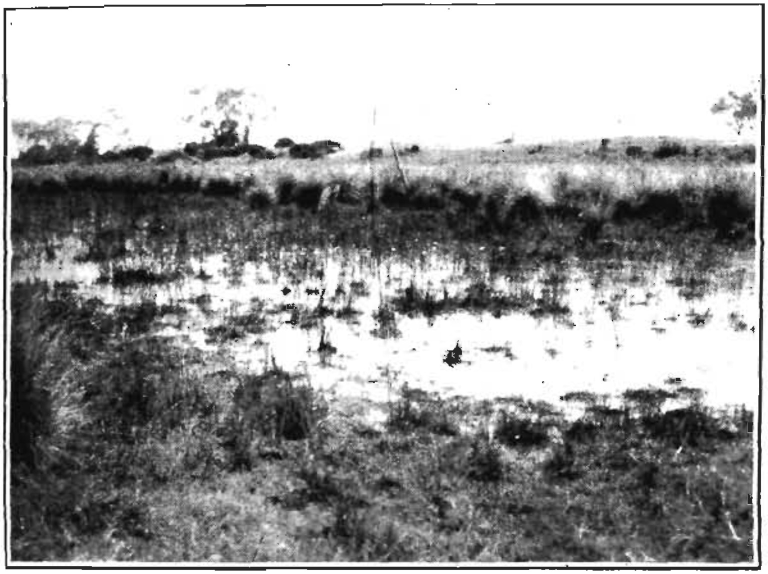

FIG. III.
A likely area for fluke.

As moisture is necessary for the life of the snail and the developing fluke, it is obvious that drainage is one of the most important factors in fluke-eradication.

SUMMARY.

1. Fluke disease is caused by a small parasite.
2. Black disease is caused by a bacillus associated with fluke.
3. The snail and the eggs of the fluke can survive only in water or under moist conditions.
4. There is no remedy for acute fluke.
5. Carbon tetrachloride is a reliable remedy for mature fluke.
6. Drainage and bluestoning assist in eradication of fluke disease.

NOTES ON THE SEEDS ACT, 1930.

By A. H. WOODFORDE, Senior Seed Analyst.

IN the last (February, 1931) issue of the Journal an article by the writer drew attention to the importance of using clean seed of satisfactory germination capacity, and pointed out the facilities offered to farmers by the Department for having their seed tested before sowing. Since that time the Seeds Act, 1930, has been passed by Parliament, and is now law. The Act is modelled on that in force in England, and requires the retailer (including the farmer who sells his own seed personally, by auction, or through commission agents) to supply to the purchaser, and to display, wherever exposed for sale, a statement setting out the purity, germination, country of origin, and noxious weed seed content of all lines of seed of the following species:—

Ryegrass (Perennial, Italian, Western Wolths, and Wimmera).
Cocksfoot.
White Clover.
Red Clover (Cowgrass).
Subterranean Clover.
Swede.

The Act is designed to give the farmer an opportunity of knowing exactly what he is buying, and, so far as the above species are concerned, should result in a considerable lessening of the risk of loss due to poor germination, or the introduction of objectionable weeds into clean areas. There are, however, several other kinds of seed in wide use, such as cereals, turnip, rape, Crimson, and Alsyke clover, &c., and farmers would be well advised to satisfy themselves about the purity and germination of all such seeds before sowing them. Farmers' samples will still be accepted for testing, and will receive the same attention as formerly.

The following is an example of the statement which the vendor is required to supply with each parcel of seed of the kinds mentioned:—

"JOHN SMITH, Launceston.

Kind of Seed: White Clover.
Country of Production: New Zealand.
Purity: 95 per cent.
Germination: 90 per cent.
Hard Seeds: 8 per cent.
Contains: 100 seeds of noxious weeds per pound.

This seed has been tested in accordance with the Seeds Act, 1930."

EXPLANATION OF STATEMENT.

Purity refers to the percentage of undamaged White Clover seed contained in the parcel.

Germination.—In carrying out germination-tests, only sound seed of the kind of which the sample purports to consist is used. Thus, the percentage quoted in the statement means that only 90 per cent. of the seed represented by the purity (95 per cent.) is germinable. By making the simple calculation—

$$\frac{\text{Purity} \times \text{Germination}}{100}$$

the total percentage by weight of pure germinating seed in the sample can be ascertained—in the above case, 86 per cent.

Hard Seeds are peculiar to legumes, and occur to greater or lesser extent in most samples of clover seed. The coats of hard seeds are covered with a varnish-like substance, deposited during the ripening of the seed in the pod. This substance, being waterproof, prevents the penetration of moisture which is necessary for germination. Hard seeds readily germinate in the soil after a natural softening of the seed-coat has taken place; but this usually requires a fairly long period—sometimes a year or more—a distinct disadvantage in the case of short-lived clovers, of which a thick stand is usually required for a limited period. Samples of clover seed sometimes contain as much as 20 to 30 per cent. of hard seeds.

BUSHEL-WEIGHT OF RYEGRASSES.

Statements accompanying parcels of ryegrass seed must show, in addition to the above particulars, the Imperial bushel-weight. This refers to the weight of seed in pounds that will fill a bushel measure, and, as an indicator of quality, bears considerable significance. Plump, well-dressed Perennial ryegrass may possess a bushel-weight as high as 28-32 lb.; that of immature samples with undeveloped kernels, or those containing an excess of chaff, may be under 20. The bushel-weight of good average lines should be about 26 lb.

The bushel-weight referred to above must not be confused with what is known to the trade as the "standard" bushel-weight, to which it has no relation. To a seedsman a standard bushel of ryegrass seed means 20 lb., and the purchaser receives 20 lb. for the catalogue price per bushel, irrespective of the true bushel-weight.

Good lines of clover seed should analyse over 97 per cent. pure. In the case of grass seeds, the percentage may usually be expected to be somewhat lower, owing to the difficulty of removing all the "chaff" without excessive loss of good seed. Well-dressed imported ryegrasses seldom contain more than 2 to 3 per cent. of "chaff," but a considerably larger proportion is common in Cocksfoot, the amount varying from 5 to 8 per cent. in fair-quality lines, to 15 per cent. in lines of inferior quality. Good swede, turnip, and rape should be over 98 per cent. pure.

APPROXIMATE GERMINATION STANDARDS.

Though germination varies for each species in different years according to the seasonal conditions prevailing prior to and at harvest, the following table indicates approximately the percentage of germination which should be attained respectively by first-class and average quality lines of seed:—

Kind of Seed.	First-Class. *Per Cent.*	Average Quality. *Per Cent.*
Ryegrasses	90 - 96	80 - 89
Cocksfoot	80 - 95	60 - 79
White Clover	90 - 95	80 - 89
Red	90 - 95	80 - 89
Subterranean	90 - 95	80 - 89
Swede, Turnip, Rape, Kale	90 - 95	80 - 89
Lucerne	90 - 95	80 - 89
Mangold	80 - 95	65 - 79

VENDOR'S STATEMENT NOT NECESSARILY A GUARANTEE OF QUALITY.

No seed may be sold or exposed for sale if it contains more than 1 per cent. by weight of noxious weed seeds, or if it is infected with lucerne flea (Clover Springtail) or any other prescribed pest or disease. It should be definitely understood that these are the only restrictions placed on the sale of seeds. The statement issued or displayed by the vendor should not therefore be regarded as evidence that, having been subjected to a Government inspection, the seed is necessarily of the highest quality. It is for the farmer to decide, having considered the information stated, whether the seed is good enough for him to purchase.

CHECKING UP CORRECTNESS OF STATEMENTS.

If any doubt is entertained that a consignment of seed is of the quality shown in the statement which accompanies it, the buyer has the right to draw samples from the seed received, and forward them for test to the Department of Agriculture. In the event of any significant difference being found between the figures quoted in the merchant's statement and those disclosed by the test, the farmer may return the whole consignment without obligation to the vendor. Before forwarding the samples, however, he (the buyer) must give notice to the vendor of his intention to have the seed tested, and afford him an opportunity of being present, if he wishes to do so, when the samples are drawn. Moreover, such notice must be given within three days of receiving delivery of the seed.

SEED IMPORTED BY FARMERS.

Consignments of seed which have been purchased by farmers direct from outside the State must in future be accompanied

Government of the State concerned. The certificate must certify that the seeds have been tested, and that they do not contain any of the prescribed pests or diseases, or any percentage of noxious weed seeds in excess of the amount allowed. Any imported seeds consigned to persons other than seed merchants which are not accompanied by such a certificate will be held up at the port of entry until they have been tested by the Official Seed-Testing Station.

FARMER-TO-FARMER SALES.

Elsewhere it has been stated that the farmer who sells his own seed, either personally, by auction, or through commission agents, is required to comply with the provisions of the Act.

It should be clearly understood that no obligation rests upon the farmer in the case of sales to seed merchants. In such cases the merchant becomes the actual seller, and is responsible that the provisions of the Act are complied with.

In special cases farmers may be granted conditional exemptions from compliance with the provisions of the Act, and applications for such should be made to the Minister for Agriculture.

Copies of the Seeds Act and regulations are obtainable from the Government Printer, Hobart, or may be seen at the office of the District Agricultural Organiser in each district.

PURE-BRED HERD TESTING.

Amendments to List Published in Last Issue.

Page 16.—Penultimate paragraph corrected to read: "The average production of heifers was 286·1 lb., or an increase of 18·2 lb. over the previous year, or an increase of 77·1 lb. during the past 10 years."

Page 17.—No. 43, Mill Farm Blue Bell. Milk should read "6395 lb."

Page 18.—Total milk for mature cows should read "703,253 lb.," and average milk for mature cow "7402 lb."

Page 21.—Junior Two-year Olds—

No. 3, Winlaton Catriona Alcartra. Production should read "Milk, 13,977 lb.; Test, 3·28 per cent.; Butterfat, 459·1 lb."; and displaces Martigny Queen Pontiac for second place.

No. 6, Winlaton Gipsy Alcartra. Production should read "Milk, 11,753 lb.; Test, 3·14 per cent.; Butterfat, 369·7 lb."

No. 11, Olivedale Barbara. Butterfat should read "232·5 lb."; and be re-classed as No. 43 on list on page 22.

Page 22.—Total production for junior two-year olds to be altered to read "Milk, 340,347 lb.; Butterfat, 16,658·5 lb."; and average production "Milk, 5579 lb.; Test, 4·89 per cent.; Butterfat, 273·0 lb."

PHOSPHATIC MANURING.

By F. W. HICKS, H.D.A., District Agricultural Organiser.

IT is recognised generally that Tasmanian soils are very deficient in phosphoric acid, a food essential for the development of plants and animals.

In the older countries the maintenance of the available phosphate supply in the soil has been secured by long-continued manuring with phosphatic fertilisers. In Tasmania, however, the general use of phosphatic manures has been adopted on a fairly general scale only during recent years.

During the past three years marked increases in the amounts of phosphatic manures used have been apparent. In the main, extension of the practice of top-dressing of grass lands has accounted for most of the increase.

The phosphoric acid contained in the soil in the virgin state is gradually depleted when land is used for agricultural purposes. The chief sources of loss are the constant growing and removal of crops and stock, and stock products such as milk, wool, and meat. It is as well to note that where stock plays a major part in the farming system, the removal of phosphates is not nearly so rapid as when a system of "cash" crop farming is practised.

The continued depletion of phosphoric acid in the soil results in diminishing crops, deterioration of pastures, and a lowered standard of health and production in stock. Soils low in phosphoric acid produce a pasture consisting largely of the poorer types of vegetation, which contain insufficient mineral matter and flesh-forming food.

The recent increase in the amount of phosphatic manures used has been phenomenal, but it is to be expected that during the present period of low prices some decline in their use will result. In spite of the low prices ruling for farm produce, it is doubtful if reducing the expenditure on fertilisers will prove a real economy. On poor pastures where, even in good times, the application of fertilisers does not show a return much above the cost of treatment, the continuance of the practice of top-dressing will have to be carefully considered, but on good pastures, and where clovers are extensively grown, it is highly improbable that a saving on the manure bill will effect any real economy. The most obvious method of decreasing the costs of production is to increase the efficiency of the farm, and on the dairy farms particularly this can be accomplished by closer attention to pasture management. In this connection the obvious suggestions are the sowing down of areas with a good, permanent pasture mixture, the establishment and maintenance of that pasture by rational manuring, attention to proper cultural treatment, and intelligent stocking. Briefly, if our production costs are to be reduced, the productivity of our pasture lands must be increased.

Realising the importance and the extent of the use of phosphates, some consideration of the forms in which they are

available may be helpful. *Phosphatic fertilisers fall into two groups*—those which are alkaline in reaction, and so tend to neutralise soil acidity; and those which are neutral in their soil reactions. None of the commoner forms of phosphate tend to increase soil acidity, and there is no foundation for the statement which is often made that superphosphate will make the soil acid.

Basic slag and basic superphosphate are the most important alkaline phosphatic fertilisers, and although for this reason these have some advantage in this respect over other phosphates, they possess disadvantages which must be offset against this. Neither can it be expected that the use of these alkaline phosphates on very sour soils is going to materially alter their acid content. Such soils often require dressings of upwards of 2 tons of lime per acre to correct their acidity, and consequently the small amount of lime contained in a 1 or 2 cwt. dressing of basic slag or basic superphosphate can have but little beneficial effect in correcting lime deficiency.

The value of any fertiliser is largely determined by the readiness with which plants are able to make use of it. This *availability* is mainly dependent upon the ease with which the material dissolves in the soil water. Three degrees of solubility are recognised in phosphatic compounds:—

(1) Water soluble phosphate is readily soluble in pure water, and consequently is quick-acting when applied to the soil. It is the most valuable form of phosphate.

(2) Citrate soluble phosphate is not readily soluble in pure water, but is slowly soluble in soil water which has a slightly greater solvent action. Phosphate described as "citrate soluble" is only moderately quick-acting, and is not so valuable as is the water soluble form.

(3) Insoluble phosphate is not readily soluble in either pure water or soil water. It is the least valuable form of phosphate, and although it is not entirely insoluble its action in stimulating plant growth is very slow.

It is commonly believed that the more soluble forms of phosphate are liable to be washed out of the soil by heavy rains, and that consequently the less soluble forms are to be preferred. This view is erroneous, as under such conditions even water soluble phosphate is retained by the soil without loss.

The following phosphatic fertilisers are of importance to Tasmanian agriculture:—

Superphosphate.—This is by far the most widely used form of phosphatic manure. It is made by treating mineral rock phosphates with sulphuric acid, and is therefore regarded by some as an " acid " fertiliser. As previously indicated, this is incorrect, as well-made superphosphate does not contain any free acid, and does not increase acidity in the soil.

The ordinary commercial superphosphate contains most of its phosphoric acid in a water-soluble form, for which reason

it is perhaps the best phosphatic manure for general use. It is readily soluble, and will give good results in the drier districts, where the moisture content of the soil would be insufficient to give best results from the far less soluble forms of phosphates. In addition, its effects are as permanent as those of the slower-acting phosphates.

Superphosphate does not contain any true lime, and the fact that it is applied regularly to land does not in the least reduce the necessity for periodical applications of lime.

In some districts in Tasmania lime and superphosphate applied to the soil have given increase in growth markedly superior to that obtained from super. alone. The two substances are best applied as separate dressings. In addition to increasing yields, the application of superphosphate to plants results in the stimulation of root development and hastens ripening and improves the quality. Super. is undoubtedly the most satisfactory phosphatic fertiliser for general use.

Basic Slag.—This is a slower-acting phosphatic manure. Although it is used fairly extensively in other parts of the world, where it is more easily procured, its use in Tasmania is not widespread.

Its value as a fertiliser is due to the amount of citrate soluble phosphoric acid it contains. Basic slag is a by-product of steelworks. Fineness of division is necessary, so that the almost insoluble form of phosphoric acid which it contains can be acted upon with the maximum result in the soil. A satisfactory sample should allow 80 per cent. to 90 per cent. of its bulk to pass through a sieve having 10,000 meshes to the square inch. It should be purchased subject to this specification.

This fertiliser has given good results on land poor in lime and rich in organic matter.

Bone Manures.—These are sold commercially under various names, such as bonedust, bonemeal, crushed bones, &c. Generally they contain from 3 to 4 per cent. of nitrogen, and from 18 per cent. to 23 per cent. of phosphoric acid. Bone manures are slow in giving a response, as they contain only "insoluble" phosphate, but their action may extend over a number of years. Their degree of availability in the soil depends upon the fineness of division: the more finely they are crushed the quicker their action.

There is a belief in certain quarters that bone manure is better for the land than superphosphate, but in spite of a search for definite instances, no clear evidence supporting such a belief has been obtained. The increasing use of bonemeal licks has created such a demand for bonemeal that for use as a fertiliser the price is becoming prohibitive.

Basic Superphosphate.—This is made by the addition of 15 parts of slaked lime to 85 parts of good superphosphate. The addition of lime to the superphosphate changes the water-soluble phosphate to the citrate soluble form, and also reduces the percentage of phosphate present. In spite of this, the basic superphosphate is retailed at a higher price per ton, so that super. is generally regarded as the more desirable fertiliser of the two.

On soils deficient in lime, basic superphosphate should give better results than the ordinary superphosphate, particularly on our red chocolate soils. On these soils, in certain instances, the application of superphosphate has given no response. This is believed to be due to the fact that our red soils are deficient in lime, and carry a large quantity of iron. The result is that the superphosphate, after being applied, unites with the iron and forms iron phosphate, which is particularly insoluble, and consequently is not available to plants. Where superphosphate has failed to give results on the red soils, basic superphosphate is certainly worthy of trial.

Ground Phosphate.—This consists of the finely ground, but otherwise untreated, phosphatic rock. It is given no chemical treatment whatever, and all the phosphate present is in the "insoluble" form. It has a very slow but prolonged action in the soil, and gives good results only when applied to areas of heavy rainfall. It is not suitable for use in dry districts.

The Application of Phosphatic Manures to Grass Lands.—The district and rainfall will determine to a large extent the quantity to be applied. As a general rule, it can be taken that under conditions of low rainfall smaller applications are more economical than in wetter districts. On areas having a rainfall of 40 inches or over the application of 2 cwt. of phosphatic manure per acre on good pasture is usually an economical proposition. Where the rainfall is lower, say 25 to 30 inches per annum, the application of 90 to 112 lb. per acre will be found to be more generally applicable.

It is now generally accepted that top-dressing of pastures is payable, but while this is generally recognised, there is a wide variation in the time of application of the manures.

There is little advantage in top-dressing with the idea of producing a vigorous growth during the spring and early summer months. Under normal circumstances the growth is usually sufficient at this time. In fact, much feed is wasted at this period, as is evidenced during summer, when rank dry grass which has run to seed occupies much of our pasture lands.

In the writer's opinion top-dressing of pastures should be done at such times that it stimulates growth when feed is actually needed, i.e., during summer, autumn, and early spring. It is extremely doubtful if one application of, say, 2 cwt., can accomplish the desired end. Two dressings of 1 cwt. each would probably have a better effect than a single dressing. At present the customary months for the application of phosphates may be set down as April, May, and in some cases June, July, or August, The dressing given during April and May cannot be expected to stimulate and prolong the autumn growth. By the time the manure is ready to do its work, conditions for good growth are absent and winter is approaching.

For the stimulation of autumn growth phosphatic manures should be applied during the month of February. If this is done the phosphate will be available when the autumn rains begin, thus stimulating and prolonging the late season growth.

In certain districts where the summer rainfall is satisfactory, there is every reason to believe that a late spring or even early summer application would have the result of stimulating the growth during the difficult months of December, January, and February. The best results from a spring dressing would be obtained when a soluble phosphate, such as superphosphate, was used.

For the spring application the best time would probably be about the middle of October. Under normal conditions pasture growth starts to decrease about the second week in November, and, as experience has indicated that it takes about two months for super. to promote growth, the time of application can be determined on each individual farm.

Tasmanian grass lands are of first importance, and their productivity and increased carrying capacity is a question well worthy of the consideration of farmers and of the community generally.

Effect of Phosphates.—On many soils the stimulation of grasses, particularly clovers, is most marked when superphosphate is used. It is found also that not only is the quantity of herbage increased, but the quality is also improved. The better classes of pasture plants are stimulated, and these crowd out the poorer species. Stock health improves and mineral (phosphate) deficiency is less marked, and in most cases eliminated.

Briefly, phosphates—

(1) Encourage root development, so increasing the feeding area of the plant, giving bigger yields and more drought resistance.

(2) When they are applied to grass lands, keep stock in better condition and help to put on greater live weight gains.

(3) Hasten ripening and improve the quality of crops.

(4) Counteract rankness of growth, which is likely to occur on land richly supplied with nitrogen compounds.

(5) Promote and stimulate the growth of clovers and the better types of pasture plants.

(6) Are not lost in the drainage water, as is often wrongly stated.

EXCHANGE SYSTEM FOR SUBSIDISED BULLS.

By J. T. ARMSTRONG, B.Sc. (Agric.), Chief Dairy Officer.

THE Bull Subsidy Scheme, which has now been in operation for some years, has been of considerable benefit to dairymen who have wished to purchase pure-bred bulls from tested dams. It has resulted in the more widespread use of pure-bred sires, with consequent improvement of herds.

Only one subsidy is available for each bull, and only one subsidy is granted to any one person. A dairyman purchasing a young subsidised bull usually keeps him for two or three years, but thereafter, owing to the bull coming back on his own stock, he has to be disposed of. As no further subsidy is available on this bull, the owner has to accept what he will bring on the market, and generally this will be far below the actual value of the animal. Also the farmer will not be able to get a further subsidy to enable him to procure another good bull, and he may have to content himself with a less valuable animal. To help farmers in a case such as this, an exchange system has been formulated.

A register of owners with subsidised bulls to dispose of will be kept at this office. By means of this scheme farmers wishing to dispose of one bull and purchase another can be put in touch with each other, so that exchange of bulls may be effected.

Owners wishing to exchange bulls are asked to notify the Department of Agriculture, when a list of names and addresses of other owners who wish to exchange bulls will be forwarded.

A dairyman should thus have to purchase only one bull—his first—and after that he can effect an exchange whenever this becomes necessary. He will also be in a position to inspect the progeny of a bull he is contemplating taking over, and see what class of stock he is throwing.

The true worth of a bull is really not known until his heifers come into profit. and under the present system a valuable animal is often sent to the butcher or lost trace of before the owner realises his real value. Under the proposed system of exchange, it is hoped that we will be able to keep trace of the various bulls which are purchased under the Bull Subsidy Scheme, or which are eligible for purchase under the scheme, and if any farmer wishes to get a proved bull back on his farm the Department will be in a position to trace the animal for him.

Another point in favour of the scheme is that it will enable a farmer to adopt the practice of line-breeding. The pedigree of bulls offered for exchange will be recorded, and it should prove possible to select bulls having the line of blood in their pedigree which the farmer requires. Most of the prominent and successful breeders are following this practice of line-

breeding. They select one particular line of blood which has been prominent in heavy-producing stock, and keep to that line. This is a more certain and quicker method of breeding up a herd of heavy-producing cows than by choosing first one strain of blood and then changing over to a different strain with the next bull.

The Department will not undertake to make the exchanges. Its function will be merely to put one farmer who wishes to exchange a bull into touch with other farmers who also desire to effect an exchange. Thereafter they must make their own arrangements.

Farmers desiring to exchange bulls are asked to forward details regarding the bull's age, name, herd, book number, and breeding to this office.

"FACE-CUT" SILOS.

Owing to the high cost of stone, brick, or cement silos, many farmers are prevented from having one of these buildings on the farm, and so are unable to conserve quantities of green feed in the shape of silage. A cheap and very effective silo can be constructed from "face-cuts," which are usually cheap in sawmilling districts.

The silo is usually built with four, six, or eight sides, but the four-sided silo is easier to construct, and is effective. Four corner posts are erected (round bush poles are suitable), and cross-members are inserted on the inside of the posts, in a horizontal position, about 2 feet 6 inches apart. The face-cuts are nailed vertically to the inside of these members. The sharp corners can be eliminated by nailing a batten diagonally across the corner and nailing the face-cuts to this. This obviates the sharp corner, and helps to eliminate waste.

Narrow boards are preferable to wide ones, as there is less warping, but if wide boards are used they should be well nailed right across their width, and be placed as close together as possible in order to exclude air. Doors can be arranged in the front to make it easier to get the silage out.

Often a silo is partly underground, and this is probably the better method. An excavation, 4 or 5 feet deep, should be made, and the silo built in the hole. A useful size is 15 feet x 9 feet x 9 feet, and a structure of these dimensions will hold 15 to 20 tons.

If possible, it is advisable to line the silo with flat iron, as in a silo of this type there is practically no loss. Cereal crops can be chaffed, and the silo filled by means of an elevator, or grass and clover can be cut green and put straight into the silo without chaffing. A whip-stick and sling will assist in elevating the material.

THE TOBACCO PLANT.

Its Life History and Culture in Tasmania.

By R. B. STEELE, B.Sc. (Agric.), B.Sc. (Forestry), District Agricultural Organiser.

IE trial planting of 330 small plots of tobacco plants through-t the State this season has created widespread interest, and merous inquiries have been received by the Department of riculture with reference to the life history of the plant and culture on a commercial scale.

The tobacco plant *(Nicotiana tabacum)* is a native of nerica. It belongs to the same natural order (Solanaceæ) as

FIG. I.
A tobacco plant 10 weeks after sowing.

ie potato and tomato. Over forty species have been described, it of these only three are of commercial importance. From iese three species many varieties have been developed by the rocess of hybridisation and selection, in order to satisfy the fferent requirements of the tobacco trade.

As tobacco is grown as a commercial crop in practically ery country in the world which has a temperate, sub-tropical, tropical climate, varieties suited to the various climatic con-tions and to the different types of soil have been developed adually in each country from descendants of the original com-ercial species. Hence there are throughout the world to-day indreds of different varieties of tobacco plants being grown mmercially, just as there are hundreds of varieties of potatoes, matoes, oats, or wheat.

Life History of the Plant in Tasmania.

The tobacco plant is classed by botanists as a half-hardy annual. Under certain conditions, however, it is really a short-lived perennial, for if the plant is not killed by frost or excessive wetness during the winter, it will live for several years, developing new shoots each season from the old stem. Observations in Tasmania show that the tobacco plant will thrive on almost any well-drained soil, provided its roots can obtain sufficient moisture during the summer months; also that it is slightly more frost-resistant than potatoes or tomatoes.

Seed.—The seeds are so small that between 300,000 and 400,000 are contained in an ounce. Generally only about 25 per cent. of the seed is fertile, so an ounce would produce

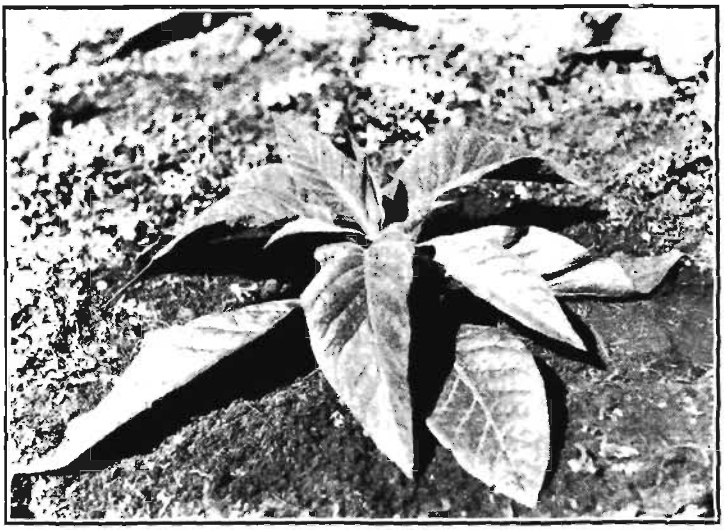

FIG. II.

The main stem beginning to shoot up from the crown of the plant.

between 70,000 and 100,000 plants if all the fertile seeds were to grow. Good seed can be purchased for 5s. per oz., and, with care, sufficient plants for from 7 to 10 acres can be raised from this quantity.

The Young Plant.—The seed, being so small, contains very little food supply; hence the young plant is very delicate in the early stages. First a pair of smooth seed-leaves appears, and then two secondary leaves at right angles to them. These are followed by pairs of larger leaves, and about 8 to 10 weeks after germination the plant has the form of a flat rosette 4 to 6 inches across. (See. Fig. I.)

The rate at which the plant grows depends on the warmth of the soil and the weather conditions. If these are favourable, the crown of the plant, when about three months old, begins to shoot up to form the main stem (Fig. II.), and this

gradually lengthens, producing new leaves from time to time. When the average plant, growing under favourable conditions, has reached a height of 1½ to 2 feet, and is about 5 months old from seed (about 10 weeks after transplanting), the flower-head appears. If this is not removed, the stem continues to grow, and the head develops and commences to flower. (Fig. III.)

The Mature Plant.—The flowers are pink, and open gradually as the main head branches out into a bushy cluster. They live for a week or two, and then die away, others opening instead. The main head continues to flower for about 6 weeks, and one

FIG. III.

A plant, 12 weeks after planting, commencing to flower.
Height 4 ft., leaves over 2 ft. long.

can find ripe brown seed-pods, green pods, flowers, and buds on the head at the same time. (Fig. IV.) A well-developed head may ripen 200 to 300 seed-pods, each containing over 1000 seeds.

The flowers are self-fertile. If other tobacco plants are flowering in the vicinity, however, insects and the wind will cause cross-fertilisation. Hence if it is desired to obtain seed true to type from a selected plant, the flower-head must be enclosed in paper before flowering commences, and remain covered until it is completed.

About the time the flower-head appears, or soon after, suckers begin to develop in the axils of the leaves. If these are left, they will grow to a length of 1½ to 2 feet, producing smaller and narrower leaves than those on the main stem, and then flower also. (Fig. V.)

Thus a mature plant that was not topped or suckered would, on the completion of its growth, have developed into a bushy plant 4 to 5 feet high and 3 to 4 feet in diameter. There would be a main centre stem carrying 20 to 30 leaves, and topped with a branching seed-head, and from the bases of most of the leaves there would be suckers branching out, also carrying leaves and seed.

By this time the bottom leaves of the plant would have turned yellow and withered away. The remaining leaves, which

FIG. IV.

On left a plant that has been allowed to flower and seed. On right a plant that has been topped to ensure maximum leaf development.

would decrease in size from the bottom upwards, would ripen in turn, and also die away if not removed.

The Second Year.—If frost and wet during the winter do not kill the plant, the main stem will throw out new shoots, which will grow away in spring.

Occasionally growers on the mainland, by removing all the shoots save one, grow a second, or even a third, crop on the same root. It is also possible to split up the main root into pieces carrying a single shoot, and then plant these out. Generally, however, the plant is treated as an annual, and after the leaf is harvested the roots are ploughed out, and the ground worked and fallowed, ready to be planted out with new plants in the spring, or else put down to some other crop to spell the land.

TOBACCO CULTURE IN TASMANIA.

The tobacco plant has been grown successfully in Tasmania for many years. Old settlers report that they grew some for their own use over 70 years ago. When sheep-scab was present in the State farmers used to grow tobacco for making sheep-wash. Fortunately the State was declared free from scab in 1881, so the production of tobacco for sheep-wash ceased. Since that time a few farmers in different parts of the State have been growing a few plants, and air-curing the leaf for their own use. Up to the present, however, tobacco suitable for smoking has not been grown in Tasmania as a commercial crop.

Production in Australia.—In certain districts in Victoria and New South Wales tobacco has been grown as a commercial

FIG. V.

Suckers developing in the axils of the leaves. These must be removed or the growth of the leaves will be checked.

crop for over 50 years. Until the last 10 to 15 years, however, the bulk of the leaf grown was of low quality, and therefore did not command a ready sale at a profitable price. Since the war the adoption of improved methods of curing, together with the use of soils better suited for the growth of good-quality leaf, has resulted in the production of tobacco of much superior quality. In 1928-29 the area under tobacco was 2238 acres, over half of which was in Victoria.

Market for Australian Tobacco.—In 1928-29 over 19,000,000 lb. of leaf was used by the 29 tobacco factories in Australia. Of this quantity, just less than 1,000,000 lb. was grown in the country. Nearly £2,200,000 went out of the Commonwealth to pay for the tobacco imported that year. Owing to the recent

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increases in the duties on imported tobacco, and also to the financial depression, the smokers of Australia have been forced to buy the cheaper brands. This has led to a greatly increased demand for Australian-grown leaf, and there is no doubt that there is a profitable market in Australia for several times the quantity of tobacco at present being produced in the Commonwealth.

Trials in Tasmania.—In November and December last the Department of Agriculture distributed 16,000 tobacco plants, in lots of 10 to 100, to 330 growers throughout the State. The leaf produced is being cured at the present time by the Department in a kiln in Hobart. The cured leaf will later be forwarded to the Australian Tobacco Investigation for testing for smoking quality and aroma. The possibility of commercial tobacco-growing in the State will be governed largely by the results of these tests.

Next Season's Trials.—Several farmers who made a trial planting of tobacco last season have intimated that they propose to make a further trial on a larger scale next season. If the tests prove that the quality of Tasmanian-grown leaf is satisfactory, probably many more farmers who have suitable land will also wish to plant a small area.

For the information of intending growers the following is a summary of the work entailed in tobacco-growing:—

1. Selection of an area of light, sandy or loamy soil, well drained and protected from wind.
2. Fallowing and deep working of the ground for some months before planting.
3. Raising sufficient plants from seed. This will require to be sown in late August or early September, in a well-prepared seed-bed, in a warm, sunny spot. The bed will require covering and watering. The Department of Agriculture will supply seed at cost price.
4. The area to be planted should receive a dressing of lime, also super. and potash. Cost, about £5 per acre.
5. Planting out from 5000 to 10,000 plants to the acre, according to the land; planting to be done in November.
6. Inter-cultivation to keep down weeds.
7. Topping the plant in January or February.
8. Removing suckers every week or two till the leaf is ready to harvest.
9. Harvesting the leaf when ripe, and curing. This will necessitate the erection of a suitable curing-kiln, with some system of artificial heating.
10. The bulking, grading, and baling of the crop ready for sale.

These various steps will be dealt with more fully in later numbers of this Journal.

APPLE LEAF-SPOT.

The leaf-spot trouble is also known as "brown spot," *Sphæropsis* spot, or *Phyllosticta* spot, and is a comparatively recent disease among certain varieties of apples. Cox's Orange Pippin, Jonathan, and Scarlets are more susceptible than other varieties; Sturmer Pippins are also affected, though in a slightly different way.

The spotting may appear early or late in the season, and consists of markings of a variety of colours in grey, brown, and purplish, and in shape may be circular, rounded, or quite irregular in outline. Some are found in the middle of the leaves, while others are confined to the edge and tips. The discolouration or blotching of the edges is often referred to as "scorching." In Sturmers, besides spotting of the surface, the edges of the leaves darken in colour to purple or bronze, and show a decided tendency to curl upwards.

The disease occurs in nearly every apple district of the State, and is being investigated by the Department of Agriculture, both from a laboratory as well as a field point of view. A year's work on the problem has shown quite clearly that the spotting is not due to any one cause alone, but that a number of factors are involved, and it will require a good deal of work before it will be possible to overcome the trouble. The following points, however, are worthy of consideration from the orchardist's point of view:—

1. Some of the rounded *brown* spots are due to the presence of the fungus *Sphæropsis malorum*.
2. The rounded *greyish* spots are due to the presence of another fungus, *Phyllosticta pirina*.
3. Both of the above are commonly found growing on leaves injured by spray fluids, or on leaves of trees in a bad state of health, *e.g.*, in neglected orchards.
4. Experiment has shown that some of the rounded *brown* spots are the result of arsenical spray burns.
5. Experiment has also shown that under certain conditions *any* spray may produce spotting and scorching; thus, if the weather is hot and sunny during, or shortly after, spraying with lime-sulphur or arsenic, and particularly if the two are combined, leaf-spot will result. On the other hand, the same kind of injury may be produced by Bordeaux under the opposite climatic conditions, i.e., if the weather is cool and damp at about the time of application.
6. Where potash has been used as a fertiliser regularly and in *sufficient* quantity this trouble is practically unknown.
7. Recent investigations in England have shown quite definitely that a similar leaf trouble of certain varieties, including Cox's, is due to a shortage of available potash in the soil; the same investigations have also demonstrated that bound up with the leaf-

discolouration is a dying back of terminals—a trouble also observed in Tasmania.

8. Three years after the application of potash fertilisers the disease in England began to disappear, but it was found necessary to apply the potash in autumn and not in spring.

Trials of manuring with potash will be initiated by the Department of Agriculture this autumn (1931), and the results will be made known in due course.

From the above it will be seen that the problem of prevention is by no means simple; but the following recommendations should receive consideration as likely to mitigate the trouble:—

1. Bordeaux should only be used as a "green tip," or dormant, spray.
2. Lime-sulphur and arsenate of lead should not be applied during the hot, sunny weather. If trees must be sprayed, the operation should be delayed until late afternoon or evening.
3. Lime-sulphur should not be mixed with arsenate of lead—both should be used separately.
4. A small trial of potash should be made, to embrace, say, 10 trees of a susceptible variety. Sulphate of potash should be broadcasted at the rate of 3 cwt. per acre over the area and up to the surrounding rows of trees.

—*Plant Pathologist.*

POISONING OF WATTLE SCRUB.

Experimental Work at Bracknell.

An area on Mr. L. Gilham's property, The Hermitage, Bracknell, has been placed at the disposal of the Agricultural Department for the purpose of carrying out work on the poisoning of wattle scrub.

The District Agricultural Organiser, Mr. R. H. Bevin, has laid out a scheme which embraces the utilisation of both arsenic and chlorate of soda, applied in solution with a swab stick after the scrub has been cut. Since it is necessary to apply the poison when the sap is on the downward run, applications are being made monthly from March to July to determine at which time the most effective control is obtained. With each cutting a small area of "control" scrub is cut. This is not treated, and will be left for comparison with the poisoned areas. Metal date-tags are fastened to the stumps for further reference and identification. At the time of going to press the arsenical treatment (5 per cent. sodium arsenate solution) applied in March appears to be successfully acting.

A detailed report on the work will be published in a later issue of the Journal.

THE MANAGEMENT OF DUCKS.

By A. E. POWELL, Poultry Husbandryman and Assistant District Organiser.

GENERALLY speaking, ducks are hardier and more easily reared than fowls. They are comparatively free from disease and seldom troubled with insects. They stand confinement well, especially the heavier breeds, and for this reason alone duck-rearing might be taken up on a more extensive scale than at present. Ducks and fowls should not be kept together. In addition to polluting the drinking-water ducks are greedy feeders, and often being very vicious, they prevent the fowls from obtaining their proper share of food. Apart from this, ducks require a different method of feeding from other poultry.

HOUSING.

The housing of ducks is a simple matter. A low shed, 4 feet high in front, 3 feet 6 inches at rear, with a length of 10 feet and a depth of 4 or 5 feet, will accommodate 12 birds. The front should be an open wire one, which will provide plenty of fresh air. The house, if possible, should face the north-east, in order to get the morning sun. The floor must be well raised and filled in with earth, or it may be bricked or cemented. A wooden floor is unsuitable, as not only does it become quickly tainted, but when once wet it remains damp for a long time, and provides a safe harbour for insects and vermin.

Plenty of clean bedding, consisting of straw, grass, or leaves, should be supplied twice weekly at least. Nests should not be provided, as ducks always prefer to make their own on the floor. They invariably cover their eggs with the bedding, and before cleaning out the house careful search should be made every morning for the eggs.

In the breeding season the ducks should be kept in the house, or at any rate away from swimming-water, until 10 a.m., as otherwise many will lay in the water, and the eggs become spoilt or lost. A good plan is to wire off part of the run next to the house, and supply them only with drinking-water until they have laid.

THE BREEDING SEASON.

To ensure an early start, and to have ducklings ready for the Christmas trade, it is necessary to have ducks mated in August or September. A breeding-pen generally contains one drake and four or five ducks, but early in the season three ducks in the pen are not too few. If unlimited space and water are available, and the aim of the duck farmer is to raise ducklings only for the market, ten or twelve ducks and three drakes may be run together. The male birds soon settle down, and seldom interfere with each other.

Young stock under 12 months old should not be mated together. A vigorous drake about one year old, mated with two-year-old ducks, as a rule gives the best results; but in all cases there should be maturity on one side or the other. Ducks may be safely bred from until they are three or four years old, but stock over that age should not be mated. The first two batches of eggs laid in the season are generally infertile, and, by those selling settings, care should be observed to make a test of fertility by placing some eggs in an incubator or under a broody hen. The results of such a preliminary trial will indicate the advisability of sending settings out to customers. Duck eggs travel badly, and great care must be taken in packing them securely.

The question of swimming-water for breeding stock is one over which there has been much discussion. Fertility is always much better when a fair amount of water is available; not necessarily deep water. A cement pond 15 feet in circumference and 2 feet deep is quite sufficient for a dozen ducks. Where a suitable water-supply is available, it could be arranged to have a plug set in the base of the pond to run off stagnant water, which could then be replaced by fresh water.

Water is especially desirable for breeding-pens of the heavy varieties, and one pond could be used in succession for many pens, one lot at a time, during the day.

Young ducks being raised for market do not require swimming-water. There is an almost general impression among beginners that ducklings should have access to water, but in reality this is a mistake, and is the cause of a good deal of trouble in cold weather. Ducklings are best kept dry while "in the down," that is, until they have got their adult feathers. Going wet to their camp at night is particularly fatal to young ducklings. While small numbers of ducklings may be successfully reared under almost any conditions, a good deal of shed room is required to rear large numbers successfully.

FEEDING.

The first essential to successful duck-farming is that cheap feed should be readily available at all times. With the present low prices of mill offal, pollard, bran, &c., duck-farming can be made profitable, more particularly when a constant supply of animal food, such as kitchen scraps, restaurant refuse, or offal from slaughterhouses, is available.

In the mash of both egg and table birds green food and boiled vegetables can be given.

To avoid waste, mash should be fed to ducks in troughs, and never thrown on the ground. In this way there is no waste, and the runs do not become tainted with sour food. Mash for ducks should be made moister than for other kinds of poultry.

The following is recommended:—

Two parts wheaten bran.
One part wheaten pollard.

With the above 25 per cent. of cooked vegetable matter and 10 per cent. of animal food can be used. Shell grit should be provided at all times.

UNIT VALUES OF ARTIFICIAL FERTILISERS.

The Agricultural Chemist of the Department submits the following list of unit values of fertilisers registered for sale during 1931:—

	s.	d.
Nitrogen—		
As nitrate	22	6
As ammonia	15	0
In blood	29	6
In blood and bone	23	0
In mixed fertiliser as ammonia	19	0
In mixed fertiliser as organic	23	0
Phosphoric Acid—		
As water and citrate soluble in—		
Super	5	0
Nitro-super.	6	6
Super. and ammonia	6	6
Super. and phosphate	6	0
Bone and super.	7	0
Organic	6	6
Basic phosphate	8	0
Complete manure	6	6
As citrate insoluble in—		
Super.	3	3
Ground phosphate	3	3
Bone and super.	7	0
Basic phosphate	3	6
Mixed fertilisers	5	0
Organic	7	0
Super. and ammonia	3	6
Super. and phosphate	3	6
Potash—		
As sulphate	6	3
As sulphate in mixed fertilisers	7	3
As muriate	5	0
As muriate in mixed fertilisers	6	0

THE ORCHARD SPRAYING OUTFIT.

By P. H. THOMAS, Chief Horticulturist.

AT the commencement of each season pest control is one of the most important items for consideration. There is no longer a market for inferior fruit, and the successful orchardist must produce only fruit of the best quality.

Orchardists the world over realise that their first line of defence against the fungi and insects which attack and injure their crops is the adoption of preventive spraying. Efficiency in application has been proved to be one of the essentials of successful control, and the spray-pump is annually becoming

[P. H. Thomas, Photo.

A GOOD TYPE OF MOTOR-PUMP.

The engine, pump, valves, &c., are accessible and protected *from the weather.*

a more important factor in the culture of the product which present-day competition demands.

Amongst the points to be considered in the choice of a spray-pump the following may be enumerated:—

(1) An efficient and economic engine of sufficient power to deliver the spray at the rate required.
(2) A strong and well-balanced carriage, with broad wheels that will allow for convenient operation.
(3) A pump in which the valves, compression chamber, and plungers are readily accessible.
(4) A good vat, preferably constructed of wood that can be easily emptied or cleaned, and fitted with an efficient agitator.

These are the most important matters to be considered when procuring a machine. The type and capacity should be decided by the topography of the area, the age of the orchard to be treated, and, to a certain extent, by the diseases and pests which have to be combated.

In assessing the costs of pest control, there is one item that stands out above all others, viz , labour. Every journey through the orchard with a spray-pump and two or three operators will add to the cost of production, and any economies which can be made in this direction will result in a substantial saving.

[P. H. Thomas. Photo.

SPRAY-PUMP FITTED WITH LONG ROD AND NOZZLE.

Favoured for trees pruned on the " pole " system.

Another factor is the possession of apparatus that will allow the different operations to be carried out quickly, efficiently, and at the proper periods. This is most important, as in order to obtain an effectual control of the different insect and fungus pests which are commonly experienced in this State, a week's delay will often mean the difference between success and failure.

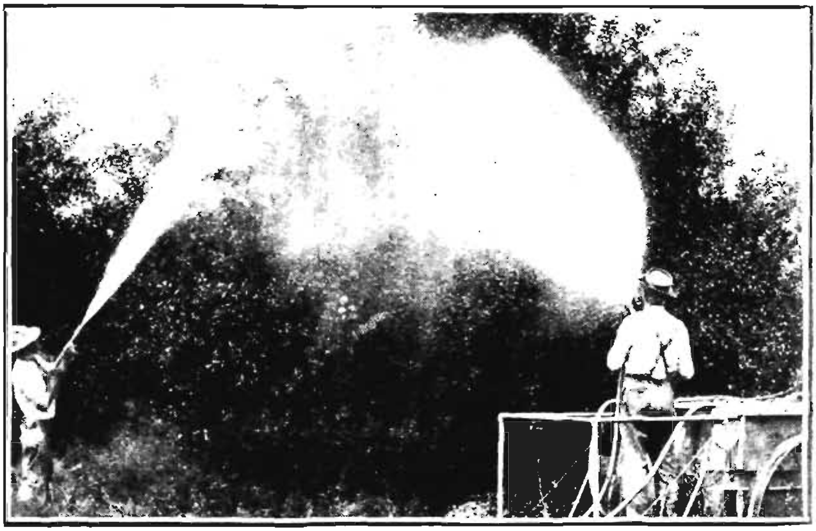
The orchardist who is content to employ a machine which is slow and of insufficient capacity to treat the area at the required period, or which involves the use of extra or unneces-

sary labour, will always be severely handicapped, especially in bad seasons.

Having considered and determined upon the capacity of the machine needed, a selection may be made amongst the various types of outfits on the market. During recent years manufacturers have given considerable attention to the improvement of orchard pumps, and to-day the orchardist is in a position to choose from a number of highly efficient machines.

TYPES OF SPRAY-PUMPS.

Orchard spray-pumps may be divided into four classes, viz., (1) the single-action barrel pump, (2) the double-action pump, which is fitted to a larger vat, (3) the motor-driven



[*P. H. Thomas, Photo.*

"SPRAY-GUNS" IN OPERATION

pump, (4) the stationary spray plant. The former two are operated by hand-power, although a machine after the type of Class (2), in which the power is supplied from a gear fitted to the axle of the carriage, has now been placed upon the market. The barrel-pump is chiefly used in small areas of orchard of 1 or 2 acres, and is a convenient outfit for the farm orchard or small area which is established to provide fruit for home consumption. This type of machine is also suitable for operation in young orchards during the early years of development. Such areas are seldom attacked by pests necessitating the application of several sprays within a short period, as during their younger stages they are generally not allowed to bear fruit.

An efficient hand-power single-action barrel-pump will deliver the spray material at approximately 60 gallons per hour, and allow the operation of one medium-sized nozzle at about 100 lb. to 130 lb. pressure. The double-action hand-

power machines are designed principally to facilitate the operation of this type of outfit, and are generally fitted with two cylinders, delivering the spray material at about 100 gallons per hour at a pressure of about 175 lb. This will enable two nozzles to be operated in a satisfactory manner, and is the type of machine that is in general use in bearing orchards, where a petrol-driven outfit is not employed.

With the improvements that have been effected in recent years, the orchardist has the choice of a wide range of petrol-driven spray-pumps. The principal features to be considered are accessibility of working parts, sufficiency of power to operate according to requirements, and convenient and easy haulage. The last feature is most important, the ideal machine being one which is designed to have the weight distributed so as to give an even balance for haulage when the vat is filled with spray material.

The motor spray-pumps which are generally favoured in Tasmania range from 1½ to 5 horsepower. The former class will discharge the spray material at about 200 gallons per hour, whilst the higher-powered types can reach as much as 600 gallons per hour. Either of these machines will carry two nozzles, the higher-powered outfits being necessary, in order to effectually operate the "gun" nozzle which has recently been placed pon the market.

SPRAY-GUNS AND NOZZLES.

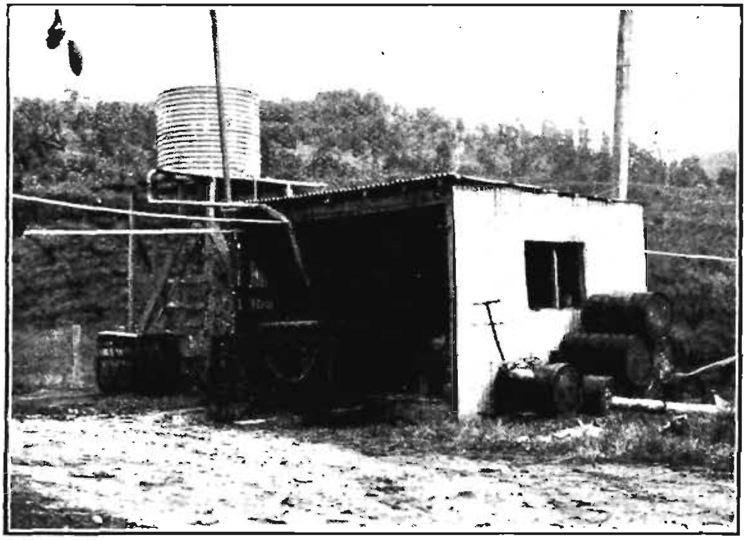
In the older-type machines different nozzles were supplied or different purposes. In other cases means of adjustment ere provided by different-sized discs, or a cock fitted so that e flow could be regulated by reducing the aperture from which e spray was forced. The "spray-gun," or "pistol," which uring recent years has been tested by orchardists has generally ound favour where adopted. Certain growers, however, still ate that they prefer the long rod and nozzle, especially for trees runed on the "pole" system. There is no doubt that the "gun" as considerably simplified the practice of spray application. he chief features are that the pressure is retained until the quid leaves the "nozzle." The jet is controlled by a lever, hich by a simple half-turn will give the operator command f a driving spray which will reach to the top of the highest trees, r throw a fine mist a few feet in front of the nozzle.

The spray-gun has also considerably improved the applicaon of certain orchard sprays, giving a better spread and more conomic delivery. Although the majority of growers who have sed this innovation are satisfied as to its increased efficiency nd economy, there are a number who, after a short trial, have iscarded it and returned to the old-style disc-spray. Where ich cases have been investigated, it is generally found that the ejection has been brought about mainly through inefficient peration. The "gun" opens up certain new phases in orchardpraying, and unless the grower meets them, and arranges his lan of operation accordingly, success cannot be achieved.

In some instances growers have tried to instal a "gun" upon a pump which has insufficient pressure. In order to obtain satisfactory results it is necessary that at least 200 lb. pressure be developed; anything below that will be inclined to waste the material and give inefficient operation.

Another important point is to see that the spray is delivered through hose and piping which are of uniform calibre. Unless this is carried out a good deal of pressure may be lost, or bursts may occur in the piping or connections.

The spray-gun delivers the material at a very high rate, and it is unnecessary to apply the same methods of application as have been in practice with the disc nozzle. Instead of carefully running up and down the main limbs, the operator



[P. H. Thomas, Photo.

CENTRAL MIXING STATION, WITH PIPES RADIATING THROUGH THE ORCHARD.

Note discarded hand-power pump on the right of the picture.

must cover the tree by directing the spray from opposite angles. This involves a speedier application than that which is necessary with the ordinary disc nozzle, and no time must be lost in getting from tree to tree if the spray material is being discharged from the pump.

STATIONARY SPRAY PLANTS.

Although the motor spray-pump has facilitated pest control, and can be effectively employed under normal conditions, certain handicaps are experienced. The difficulties of treatment when adverse weather conditions prevent or limit operation are always a constant worry to orchardists throughout the

spring months. A few years ago certain orchardists in America, realising the disabilities of the mobile spray-pump, set about trying to surmount these difficulties by equipping their orchards with a permanent pipe installation, by which the spray could be pumped from a central point and applied over the area.

The advantages obtained by such a method of treatment are important, viz.:—

> The grower is not so dependent on the weather conditions for application, and is able to take full advantage of *short favourable periods occurring at the proper time* of treatment.
>
> The difficulties of transporting a heavy spray vat and engine over sodden ground are eliminated. As a time-saver it is ideal—the long journeys to the water-supply and constant refilling of the vats are done away with, while trees on steep banks and broken ground are easily treated.

[*P. H. Thomas, Photo.*

OVERHEAD PIPE SYSTEM LAID THROUGH STEEP AND BROKEN COUNTRY.

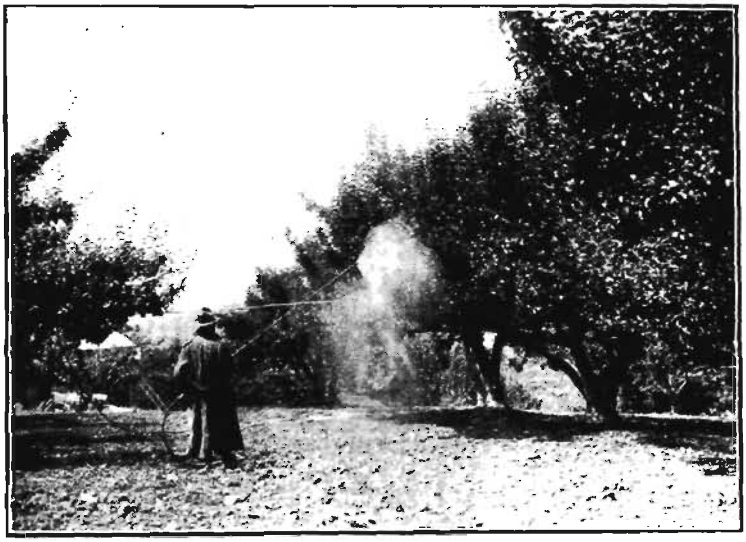
The method of installation and operation is fairly simple. A central location in the orchard, to which the water-supply can easily be brought, is chosen. Here the engine, pump, and mixing-vats are assembled, and connected to the delivery pipes. These are laid either above or below ground through the orchard at convenient intervals, and suitable points are selected for tapping and application.

In Tasmania two different systems of spray delivery have been adopted: one in which the liquid circulates through the pipes and can be returned to the mixing-vats; the other in

which the pipes are laid in sections to a dead end, necessitating the expulsion of any spray in excess of that required.

When preparing sprays for application, time may be saved by equipping the plant with two mixing-vats, or a large one with a central partition, so that whilst one is being emptied, another batch of spray can be mixed for delivery.

To-day the principal orcharding centres of Tasmania are linked up with the State power-supply. Electricity is being used in the orchard industry for many different purposes, and



[P. H. Thomas. Photo.

OVERHEAD PIPE SYSTEM.

Showing hose connected and sprays being applied.

growers who have installed stationary spray plants are deriving the power for running their outfits from this source.

The stationary spray-plant possesses certain definite advantages, and, if found to be efficient and within the range of the average grower, should be a valuable aid to the fruitgrowing industry, and, incidentally, another avenue in which the State power-supply can be utilised.

The photographs of the stationary spray plant illustrating this article were obtained through the courtesy of Mr. G. H. Kile, of Castle Forbes Bay, Huon.

POTATOES.

Virus Diseases and Seed Selection.

By C. E. W. OLDAKER, Agronomist.

DURING the past two seasons one of the important Departmental activities has been an educational campaign embracing methods of elimination of degeneration diseases of potatoes.

How seriously these diseases are responsible for lower, and still lower, yields is now well known. The three well-known forms of virus diseases are common to all potato-growing countries of the world, and are known to be present even in the wild potato varieties still found growing in South America.

Authorities are unanimous as to means of transmission, influence on the growing plants, and certain methods of combating the disorder.

Following upon foliage injury, the tubers are reduced both in size and numbers, and infected tubers used as seed are certain to reproduce the disease. Considering that all commercial production is through non-sexual vegetative propagation, it is obvious that the progeny of a plant having a diseased sap flow must be affected, and any doubt as to the transmission of the disease through this means has been entirely dispelled.

There is no need here to touch upon cross-infection of the growing plant by sap-sucking insects. This aspect has been fully dealt with in previous articles in the Journal, and it is now common knowledge amongst farmers that seed should be chosen from a well-tended, well-rogued crop from some high inland district, where aphis is not active or is almost absent.

It is sometimes said that certain varieties have " run out." This view, however, is almost invariably a recognition of the fact that disease has gained the upper hand. Regardless of the possible dislocation of a trade habit or fashion for well-known and approved kinds with which the consuming public is familiar, new varieties are advocated as the only remedy.

Much improvement can be effected by selection and rogueing on the part of the seed-growers in suitable districts of high altitude and generous rainfall. Dr. H. M. Quanjer, who for a number of years has been recognised as a leading authority with respect to Mosaic and allied diseases, says:

> " The potato plant has already been so much crossed that I doubt whether further efforts in combining the most heterogeneous parent types can give new and better results. Instead of always producing something new, we should endeavour to keep the old, local, well-adapted varieties in good condition."

Admittedly the importation of a new type, or the production of something new under skilful cross-breeding, may be attended by very valuable results, but concentration upon either

of these methods to the exclusion of selection of hitherto valuable and proved stocks may leave the grower in still greater difficulties.

Many encouraging reports have been received as a result of the propaganda and field days conducted by Departmental officers last year. Both in the Midlands and throughout elevated districts of the North-West Coast plots grown from the progeny of selected plants are showing excellent promise. A number of progressive growers, realising the importance of "seed," and the insistent and ever increasing demand for good stocks, are taking up the practice of rogueing in a commendably determined way. There is any amount of room for effort. Tasmania requires a quantity approaching 20,000 tons of seed in a normal season, and the proportion of this quantity which would conform to a certified seed standard during the last few years has been regrettably small. The far-seeing producer of reputable seed who, working on sound lines and under suitable conditions, goes forward to still greater improvement may be assured of financial success.

Comparatively heavy rogueing at the commencement is not the serious matter it may appear. Only diseased plants are removed, and this should be done as early as possible. In any case such plants would be low-yielding, and by way of compensation greater space is made for both root and foliage development of those remaining, with heavier tuberation as a result.

An outstanding case is that of a grower in the north-west who, fearlessly attacking the position, removed no less than 50 per cent. of his crop as undesirable. Before rogueing the standard was above the average type employed as seed, and despite such drastic treatment the final yield was slightly over 7½ tons per acre—surely a satisfactory result, having in mind that such a large percentage of plants had been removed. Crops grown the following year fully exemplified the wisdom of the grower's action. One section of a field near the coast planted with this seed, against two other lots from a district known to be capable of producing good strains, showed up markedly superior. The rogued seed produced a probable maximum of 15 per cent. off type plants, while both other lots showed nearly 100 per cent.

In further confirmation of what may be done by selection, two small plots grown in the Devonport district from seed for which the parent plants were chosen and staked by a Preston grower are instructive. Fifty plants of "Medium-top Brownell," and thirty of the "Big-top" type, are being grown, and at the time of writing in each case there is no trace whatever of virus disease. Every top is splendidly developed, and all the plants are uniform in size and appearance.

will remove dirt, but the disinfectants mentioned will kill many of the germs which still remain after washing.

In the dust which is disturbed in dirty cowyards and earth or slab floored milking-sheds are millions of organisms, some of which must fall into the milk during the process of milking. A cement-floored shed and a good yard can be kept free from cow-dung and dust, and thus the source of contamination is minimised.

Any utensil with cracks or crevices, in which milk or cream lodges and cannot be thoroughly cleaned out, is a probable source of trouble. Bacteria will develop in these crevices, and contaminate the next lot of cream or milk put into such vessels. This is the reason why the Department condemns kerosene-tins as receptacles for milk or cream. There are seams in these tins which it is absolutely impossible to clean thoroughly. In general, any utensil having crevices from which milk or cream cannot be thoroughly cleaned is a constant source of trouble, and should be avoided.

In regard to washing utensils, much advice appears to be necessary, as on very few dairy farms are the utensils properly cleansed. There is a big difference between a bucket mechanically clean and one bacteriologically clean or sterile. The first operation in washing any milk or cream utensils is to scrub them thoroughly with a brush in lukewarm water to which a little soda has been added. They should then be placed in boiling water, and kept at the boil for at least five minutes. After removal from the boiling water the separator discs should be placed loosely on the pin, and other parts should be hung up or placed on a clean shelf. They will be hot enough to dry quickly. The boiling of the utensils will have killed most of the germs on them, and on the clean, dry surface any germs which may lodge there will not develop; but if the utensils are not boiled, and are left damp, there will most certainly be a seeding of germs ready to infect the next milk or cream put into the vessels.

Bacteria, like all other forms of life, require food, moisture, and a suitable temperature for their development, and given ideal conditions of food-supply and temperature, they develop and multiply very rapidly. An individual organism merely divides and becomes two organisms, and under ideal conditions this division can take place every 30 minutes. So if we start with one germ, it is possible in 24 hours for the organism to have multiplied to about 17,000,000.

Milk or cream provides ideal conditions of food and moisture for germ life, but for rapid multiplication germs require warmth, and we can, to a certain extent, control the temperature of milk and cream. Bacteria will live, but will not develop rapidly, in cold cream, hence the advice to cool cream. Even where contamination is heavy, if the cream is cooled quickly after separating and kept cool, the number of germs will not increase rapidly; but if the infection is only slight at the start, and the cream is not cooled, then very soon there will be as many germs present as in a cream which was originally heavily contaminated.

The aim and object of every dairyman, therefore, is to keep his cream as free as possible from bacteria, and then to

keep it cool so that any organisms which may have gained access will not develop and multiply. The heavier the original contamination, the more rapid will be the increase in numbers of the bacteria present, and the quicker will the cream develop taints and deteriorate in quality.

CONTROL.

In this respect there is some truth in the theories advanced that the hot weather and strong winds are the causes of cream deterioration. The strong winds stir up the dust, and increase the risk of germs blowing into the milk or cream, and the hot weather, by warming up the cream, aids the development of germ life and the subsequent taints which the organisms produce.

With regard to mineral deficiences causing taints, it is not considered that there is sufficient data available to substantiate this theory. Where a pasture is deficient in minerals the quantity of cream will be adversely affected, but generally there will be no effect on quality.

Clover alone is not as good a ration for stock as a mixed pasture, and may affect the quantity of the yield, but by proper management should not affect the quality of the cream. A choice cream can be produced from cows grazing on clovers alone.

The percentage of fat in the cream is of more importance than many farmers think. We find tests at the factory varying from 20 to 60 per cent. butterfat. To have cream of a good consistency, and to get even ripening, a test of from 38 to 42 per cent. is most desirable; the lower test in winter and the higher test in summer.

Frequent and thorough stirring is necessary. The lactic acid producing germs, which are the necessary ripening agents, are thus distributed. These germs will work and multiply at a lower temperature than the majority of harmful germs, and the acid they develop has a tendency to check the growth of the undesirable types.

This series of articles is being written in conjunction with a series of lectures and discussions on cream quality to help dairymen to locate the faults in their cream.

There is nothing to compare with a personal visit to the farm, but unfortunately the Department has not the necessary staff to enable every dairyman to receive a visit. There are between 4000 and 5000 dairymen supplying cream to factories, and it can be readily seen that it will take a long time to visit every supplier; but if farmers take note of the various articles which the Department sends out in bulletin form and in the Journal, and put into practice the advice given, many will be able to overcome their troubles without waiting for a dairy officer to come and locate the various faults. Other States have been in the position which we are now in, and have overcome their difficulties. We have a much cooler climate than the mainland States, and this should give us a big advantage. We will have to tackle the problem as they did—put our milking-sheds and dairies in order—and before long we should not be much troubled with second-grade cream.

NOTES ON LIME, ITS VARIETIES AND ITS RELATION TO FERTILITY.

By W. J. DOWSON, M.A., D.Sc., Plant Pathologist, and E. R. HUDSON, Dip. C.A.C., B.Sc., B.Agr., Superintendent of Extension Service.

INTRODUCTION.

MOST farmers know something about lime and the advantages to be gained by its judicious application to soils, but as there is more than one kind of lime used for agricultural purposes, the following notes on the various " limes " on the market—their chemistry, action, and relation to fertility—may be of some interest.

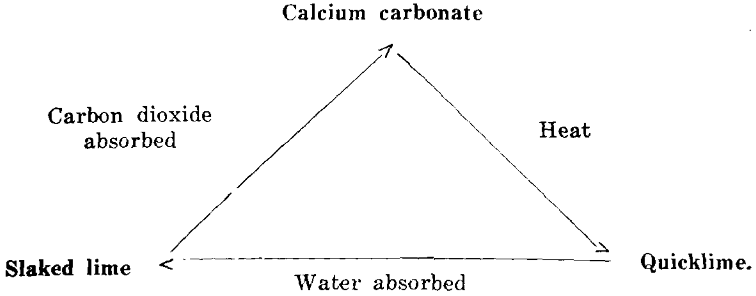
In the first place, the beneficial results of liming have been known from very ancient times; thus the Roman invaders of ancient Britain during the first centuries of their occupation record that the Britons were in the habit of scattering great quantities of chalk or marl on their patches of cultivation. It seems to have been the custom to do this once in every generation. The procedure has continued down to the present time, but, due partly to rising costs and partly to the discovery and use of artificial manures, is now not practised so much as formerly. Even at the present day, in certain parts of England overlying the chalk, the operation of chalking may occasionally be witnessed. This consists of the simple process of digging a large hole in the ground until the chalk strata are reached, and raising the chalk in baskets with the aid of a windlass. The baskets are emptied over the fields, and a dressing of anything between 50 to 100 tons to the acre is applied. When it is remembered that most Tasmanian soils contain less than 10 tons of lime to the acre, it will be realised that there is an enormous difference between the lime content of the soils of the two countries; and there is no question of the great fertility of English soils. The same is true to a lesser extent of New Zealand, where liming has been resorted to only within recent years, but with a satisfactory increase of fertility.

The word " lime " is used in a general way for a number of substances differing considerably in composition, but all having the element calcium as a basic constituent. To appreciate the relationship of these different substances it is necessary to consider their composition and the changes which they undergo.

Limestone, or calcium carbonate, may be regarded as the parent substance. When limestone is " burnt " it gives off large quantities of carbon dioxide gas, loses weight, and changes to quicklime. Water coming into contact with quicklime changes it to slaked lime. Slaked lime after a time absorbs carbon

dioxide gas from the atmosphere, and changes back into calcium carbonate.

This cycle of changes may be represented thus:—



Calcium carbonate occurs naturally in the form of limestone rock, which is usually quarried in blocks. It varies considerably in hardness and colour. Marble, sea-shells, chalk, and marl are other forms of the same substance.

Generally it is necessary to grind these substances to a fine powder before they can be profitably used as a dressing to the land. When so ground, the material is marketed under the name of "ground limestone" or "ground carbonate of lime."

Quicklime is also known as burnt lime, roach lime, and sometimes as caustic lime, while slaked lime is sometimes called hydrated lime.

If quicklime is added to the soil, it first of all absorbs moisture and changes to slaked lime, from which form, by absorbing carbon dioxide gas, it may readily change to the carbonate from which it was originally derived. Other changes and reactions with other soil constituents may intervene before this latter change is complete, but for practical purposes there is no material difference in the effects of quicklime, slaked lime, and ground limestone when applied to the soil. The weight of evidence is inclined to be in favour of the milder and less caustic carbonate, rather than the more active quicklime, or slaked lime. This is especially so when application is made to areas under crop, grass, or laid out in orchard.

We can regard the form of lime used as a matter of comparatively little importance. What is important is that the purchaser should know the relative value of the different kinds of lime on the market.

During the "burning" process pure limestone loses 44 per cent. of its weight in the change to quicklime. This 44 per cent. consists of gas, which may be again readily absorbed from the air after the quicklime is applied to the soil. It is of no material value. The remaining 56 per cent., consisting of quicklime,

contains just as much lime as did the original hundred parts of limestone.

In other words, 100 parts of *pure* limestone are of only the same value as 56 parts of *pure* quicklime. If pure quicklime can be bought at 40s. per ton, then the value of a ton of pure limestone should be $\frac{56}{100}$ of 40s. = 22s. 5d.

If quicklime is slaked to give slaked lime, it increases in weight through the absorption of water. Fifty-six parts of pure quicklime will absorb 18 parts of water, to give 74 parts of the slaked lime. Consequently if the above value is given to quicklime, the equivalent value of a ton of pure slaked lime is $\frac{56}{74}$ of 40s. = 30s. 3d.

Put in another way, limestone is the least, and quicklime the most, concentrated form of lime; slaked lime is intermediate between the two.

We can summarise the foregoing by the statement that 100 parts of limestone, 74 parts of slaked lime, and 56 parts of quicklime all contain the same amount of lime, and are therefore of equal value on the farm. The above applies to the *pure* substances, but as commercial limes are always more or less impure allowance must be made accordingly. This is important from the purchaser's point of view, as many limestones contain as much as 30 per cent. dross or foreign matter. This percentage increases when the limestone is burnt, as usually only the calcium carbonate content of the stone loses much weight, and the dross remains unchanged.

Lime, in whatever form, should always be bought on its analysis, and the farmer should refuse to consider purchase unless the percentage of purity is stated.

To be able to compare the value of a given limestone with any given quicklime it is necessary for the purchaser to be able to transpose one set of figures applied to limestone to equivalent values for quicklime, or *vice versa*. The same applies in the cases of limestone and slaked lime, and quicklime and slaked lime. The procedure adopted appears difficult to follow, but the principle is the same as would be adopted if, say, the following quotes were received for fencing:—

£80 per mile.
£1 2s. per chain.
9d. per yard.

The obvious procedure is to express the facts in common terms. For the purpose of comparison, it does not matter whether the per chain and per yard quotes are changed to the equivalent value per mile, or the change is made to a per chain or per yard basis; all that is necessary is to have uniformity. Take the following example:—Ground limestone of 90 per cent.

purity is quoted at 25s. per ton; quicklime of 64 per cent. purity is procurable at 40s. per ton. A farmer wants to determine which is the cheaper.

This problem may be solved in many different ways. The following solution, involving the conception of units and unit values, is probably the simplest:—

A unit of any fertiliser is 1 per cent. of a ton of the "pure material." Superphosphate containing 20 per cent. of phosphoric acid contains 20 units per ton; limestone of 90 per cent. purity contains 90 units of pure limestone (calcium carbonate) per ton.

If, as in the above problem, the limestone is 90 per cent. pure, and costs 25s. per ton, each 1 per cent. of a ton, or each unit, costs 25s. divided by 90 = 3·3d. per unit. Three and a third pence is then said to be the unit value of calcium carbonate in this lime.

Similarly, the quicklime of 64 per cent. purity, and costing 40s. per ton, has a unit value of 40s. divided by 64 = 7·5d. per unit of quicklime.

The unit of quicklime is different from the unit of calcium carbonate, just as the mile unit of measurement is different from the chain unit in the supposititious fencing quotes instanced above.

We have previously seen that—

100 parts of pure limestone (calcium carbonate)
56 parts of pure quicklime
74 parts of pure slaked lime

are all equivalent.

Since 100 parts or units of carbonate are equivalent to 56 parts or units of quicklime, each carbonate unit is only $\frac{56}{100}$ of a quicklime unit in value. Conversely, a quicklime unit is equivalent to $\frac{100}{56}$ of a carbonate unit. Therefore to compare the two unit values above, i.e., 3·3d. for the limestone and 7·5d. for the quicklime, we have to multiply the 3·3d. by $\frac{100}{56}$ or multiply the 7·5d. by $\frac{56}{100}$.

Adopting the first alternative, we get 3·3d. $\times$ $\frac{100}{56}$ = 6d. This solves our problem. The unit value of lime (quicklime equivalent to carbonate) in the limestone is 1·5d. (7·5d. minus 6d.) cheaper than in the quicklime.

The above example is given to enable those sufficiently interested to master the principle, to do so. For others the following table of comparative percentages has been worked out. Where percentages are shown as greater than 100 the reader will understand that the figures are comparative and not absolute.

EQUIVALENT PERCENTAGES.

Quicklime.	Slaked Lime.	Carbonate of Lime.	Quicklime.	Slaked Lime.	Carbonate of Lime.
38	52	70	70	93	125
40	53	72	71	95	127
41	54	74	72	96	128
42	55	75	73	97	130
43	57	77	74	98	132
44	58	79	75	99	134
45	59	81	76	101	136
46	61	82	77	102	137
47	62	84	78	103	139
48	63	86	79	104	141
49	64	88	80	106	143
50	65	90	81	107	144
51	67	91	82	108	146
52	69	93	83	110	148
53	70	95	84	111	150
54	71	97	85	113	152
55	73	98	86	114	153
56	**74**	**100**	87	115	155
57	75	102	88	116	157
58	77	103	89	118	159
59	78	105	90	119	161
60	79	107	91	120	162
61	80	109	92	122	164
62	82	111	93	123	166
63	83	112	94	124	168
64	84	114	95	126	170
65	86	116	96	127	171
66	87	118	97	128	173
67	89	120	98	130	175
68	90	121	99	131	177
69	91	123	100	132	178

THE PHYSICAL ACTION OF LIME ON SOIL TEXTURE.

Most farmers are acquainted with the fact that the addition of lime to a stiff, heavy soil alters the texture very considerably. This is because contact with the lime causes the minute particles of clay to cohere together into clumps, thus making the soil particles coarser or more granular. This, in turn, greatly improves the aeration of such a soil, with the direct result that root development is promoted. Roots of plants are thereby enabled to range over a larger volume of soil for food substances, and incidentally the deeper rooting system makes the plant more drought resistant.

These are not temporary changes in the soil, but last for many years. While opening up a stiff soil, liming has the opposite effect on a light, sandy loam, which it renders more cohesive.

THE BIOCHEMICAL ACTION OF LIME ON SOILS.

The physical improvement of soils is by no means the only change which takes place. Certain chemical and biological actions are initiated, the results of which are of the utmost importance to the farmer and orchardist.

As has been indicated above, most Tasmanian soils are sour, or even acid in reaction, and from the farmer's point of view plants may be grouped into three types, according to whether they flourish or not on such soils. Thus there are distinctly acid-loving plants, such as gorse, bracken, honey weed, and sheep's sorrel, all of which tolerate acid conditions, and tend to replace other plants. Only a few agricultural crops come into this category, namely, oats, rye-corn, and potatoes. At the other extreme there are plants which are markedly lime-loving, for instance, most legumes; and between these come the great majority of plants which grow best on slightly alkaline soils, but which will tolerate a moderate amount of acidity. Most of our crops, including fruits, fall into the last group. They do best in soils containing a slight excess of lime, but are said to be " uncertain " on acid soils. Lime, being alkaline, will produce these more favourable conditions by neutralising acids present in soils.

The decaying remains of plants produce humus, which gives to soil its brown colour, and which is rich in compounds of nitrogen. In general, the more humus there is, the richer is a soil in this important plant food; or, in other words, the greater is the fertility. Bound up with the richness of the soil in food material is the ease with which such materal becomes available to plants. There may be, and often are, plenty of foodstuffs present in soils, but in a form which plants cannot use.

As is well known, plants take up their nitrogenous food in the form of nitrates, which are produced from the complicated humus material by certain soil organisms called nitrifying bacteria. These bacteria can thrive and multiply only in a neutral or slightly alkaline soil. In an acid or sour soil they are much reduced in numbers, and the formation of nitrates from humus is restricted, with the practical result that plants grown in such soils are short of nitrates. Such shortage can be made up to some extent by the application of artificial fertilisers like nitrate of soda or sulphate of ammonia.

The best and most economical means of providing adequate supplies of nitrogen is to keep the soil well supplied with organic matter by practising a sound rotation, using forage crops, running plenty of livestock, growing clovers, and by green manuring. If this is done and lime is used, the provision of a good supply of nitrogenous plant food will be assured.

Lime and Availability of Essential Minerals.

Besides the part played by lime in producing more nitrates in a soil it has a similar action in relation to the availability of two other essential plant foods, namely, phosphates and potash.

Both these are present in most soils as the result of the disintegration of the original rocks from which the soil is derived, but the disintegration products are for the most part

insoluble, and are therefore not available to plants. As far as the plant is concerned both potash and phosphates in such forms might just as well be entirely absent. Lime reacts with these insoluble bodies to form soluble compounds of potash and phosphorus, which thus become available to plants, whilst the lime forms insoluble substances. It follows from this that the added lime gradually becomes used up, and hence the necessity of periodically replenishing the supply.

Whether quicklime, slaked lime, or ground limestone is applied depends upon such factors as cost and soil conditions. On stiff fallow land quicklime is the best, but, being caustic, it is unpleasant stuff to handle. For the same reason, this form of lime is not desirable for growing crops or trees, as the young roots are apt to be burnt, and for the time being even the beneficial bacteria are inhibited from working, so that immediately after the application of quicklime the quantity of nitrates falls off, and it will be some time before it recovers. On the other hand, when recovery has taken place the result is likely to be lasting for many years, particularly where heavy dressings (4 tons and upwards) have been applied.

Air-slaked lime is not so caustic, and can be used on most soils with safety. Ground limestone is safer still, as it possesses no "burning" qualities. However, as the above table shows, there is not so much lime in ground limestone as there is in slaked lime or in quicklime, so that if it is necessary to apply 4 tons of ground limestone to the acre to make the soil reaction neutral, the same result will be obtained by using approximately 3 tons of slaked lime, or about 2 tons of quicklime.

The Time to Apply Lime, and the Quantity.

In general, the best time to apply lime is in autumn or winter, but ground limestone may be applied at any time and on any soil. On account of their caustic properties, where possible, both air-slaked lime and quicklime should be applied to fallow land. Lime in its air-slaked form, or ground limestone, can be mixed with fertilisers like superphosphate or sulphate of potash; but no form of lime must be added to sulphate of ammonia. Lime reacts with this compound, with the result that the nitrogen it contains is liberated as ammonia gas, which is lost in the atmosphere.

Finally, it must be remembered that lime is not a quick-acting substance, but requires considerable time before its beneficial effects are visible. That no obvious result is forthcoming during the season following the application of lime is no cause for disappointment. Improvement in pastures is slow; on heavy land, such as some of the Rothamsted fields in England, the character of the vegetation did not begin to change until the third year after liming. In this State the quickest response has been obtained with peas, which have shown a marked increase of yield and vigour in the season after application.

In order to arrive at a measure of the increased production brought about by treating soils with lime, the Department has arranged for large numbers of experimental plots in various districts.

In the course of a few years it should prove possible to make a precise statement regarding the economics of the practice. Meanwhile, considering the ruling prices for all forms of lime, and the limited experimental data available, the Department at the moment is not in a position to recommend the widespread adoption of liming under general farming conditions.

Under intensive production conditions, such as exist in orchards and highly improved farms, applications of lime can reasonably be expected to show a handsome return, but where extensive methods are in vogue the farmer is advised to proceed warily, and explore the possibilities by experimental applications on small areas.

In most districts it is impossible to maintain a good pasture unless top-dressing is practised, while clovers in general, and Subterranean clover in particular, cannot be grown satisfactorily without the aid of super.

ANSWERS TO ENQUIRIES.

Question.—When pruning my pear-trees I noticed that a large number of the shoots bear small dark blisters, sometimes so clustered together as to cause a cracking of the bark. Of course, most of such twigs are pruned away; but is there any harm in leaving a few, as it is neither easy nor desirable from a bud point of view to cut away all affected parts?

Answer.—It is very important to cut out all shoots such as you describe—right to the parent limb—even if it means sacrificing a certain number of fruit-buds. The small dark blisters you have noticed constitute one of the stages of the black spot disease, and act as vigorous sources of infection next season. In other countries apples are affected in the same way, but in Tasmania this form of black spot occurs only on pears.

—*Plant Pathologist.*

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ANSWERS TO ENQUIRIES.

Question.—My separator was recently out of use for a few days owing to a part having been broken, and while the separator was out in the sun I noticed that it was "sweating," and that the parts had a peculiar smell. As I am always careful to wash it in boiling water immediately after I have used it, can you account for the separator being in this condition?

Answer.—Immediately after use the separator should be rinsed with warm or tepid water, so that the milk and cream are washed off the metal before the pores are opened by the boiling water. By this means you will prevent the wash water from getting into the metal, and by thoroughly washing, and finally boiling, the parts of the separator it can be kept perfectly clean and sweet.

—*Extension Service.*

Question.—I have a paddock of lucerne which has been down for three years and has been top-dressed each autumn, but it is now inclined to be yellow, though it has not lain wet. The nodules on the roots are only small, and very few in number. Is it possible that the weeds among the lucerne are taking the nitrogen?

Answer.—Your paddock probably needs a good surface cultivation. The bacteria in the nodules on the roots take their nitrogen from the air of the soil, therefore the top surface of the soil should be well moved to allow the air to enter.

This cultivation, besides keeping down the weeds, will assist the bacteria in their work of assimilating nitrogen, which, judging by the yellowing of the crop, is apparently deficient in your paddock.

—*Extension Service.*

Question.—I have a property on the East Coast, and although my sheep show signs of needing a lick, I cannot get them to eat the lick advised by your Department, though the sheep on my Midland property eat it readily. What would you advise me to do?

Answer.—Try feeding pure sterilised bonemeal. It has been found in many cases on the Coast that sheep have no salt hunger, owing to their having access to the beach, but will readily eat pure bonemeal.

—*Extension Service.*

Question.—During dry periods of the year I often notice a white sediment round the edge of the waterholes on my runs, and have been told that this is alum. I feel sure that something must be wrong with the water, as the cattle develop swollen joints and never keep in good condition on these runs. Can arrangements be made for this water to be tested by your Department?

Answer.—Yes, the Department will test a sample of the water if you will forward one quart to your District Organiser.

Many samples have been received from farmers experiencing the same trouble as yourself, and in each case the sediment has proved to be common salt, which hardens the water, but is not present in sufficient quantities to be injurious to stock. The trouble with the cattle has been due to a different cause, namely, deficiency disease, and this has been remedied by supplying a lick made up as follows:—Common salt, 100 parts; bonemeal, 50 parts; superphosphate, 10 parts; sulphate of iron, 1 part—mixed with a solution made up of 1 part of molasses to 3 of water.

—*Extension Service.*

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TOMATO VARIETY TRIALS.

By P. H. THOMAS, Chief Horticulturist, and T. D. RAPHAEL, Horticulturist.

DURING the early part of last spring it was decided to try out a number of the principal varieties of tomatoes grown in England for commercial purposes.

Accordingly seed from about 18 selected kinds was shown under glass, and the plants raised in the usual manner. Two plots were planted at Hobart, and a number of plants were sent to various parts of the country for trial under local conditions, planting being carried out in early October.

The plots in Hobart were visited at weekly intervals, observations as to growth and fruit set being made on each occasion. It was decided to stake half of the plants, and grow them on the "single stem" system, all side shoots being removed and the plants stopped at about six trusses. The remainder were grown under the "free set" system usually adopted for outdoor culture in Tasmania, practically no pruning being done to these plants. By this arrangement it was possible to make comparisons between the two systems, and compare their suitability to the particular variety treated.

GROWTH.

The soil in which the plants were grown was a good sandy loam, dressed with farmyard manure before planting. Growth was therefore rapid, and, to the detriment of their fruitfulness, some of the naturally vigorous varieties were rather gross in the early stages. The most vigorous growers noticed during the early part of the season were Dobbie's Earliest, Essex Wonder, Riverside, E.S.1, E.S.2, Early Dawn, and Golden Eagle. Amongst the other varieties planted, Ailsa Craig, Dobbie's Champion, and Kondine Red were also making good development. In December Kondine Red, Riverside, E.S.2, Early Dawn, and Selected Open-Air were amongst the best growers; and in January Riverside, E.S.1, Bide's Recruit, and Blaby were the most prominent.

The falling-off and variation in growth of the different varieties as the season progressed might be attributed to three main causes:

(1) The droughty conditions and inability of certain varieties to withstand them.

(2) The season of the variety; the earlier varieties having practically finished growth.

(3) The set of fruit; such varieties as Selected Open Air having set almost all the flowers on the first three trusses.

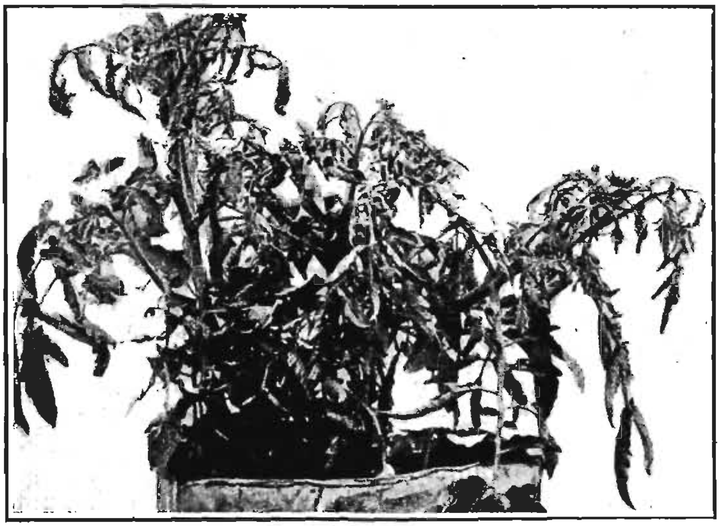


FIG. I.

Plant of Rough Red affected with spotted wilt.

EARLINESS.

The value of a good early outdoor tomato can scarcely be overestimated, and it was hoped that some of the varieties under trial might prove satisfactory in this respect, though planted out somewhat late in the season.

The earliest varieties to mature fruit in the plot at New Town were Dobbie's Earliest and Early Dawn, a number of these being picked at the end of December. During the first week in January the bottom trusses of Kondine Red, Daniels' Selected Open-Air, Australian Rough Red (planted at the same time), and Riverside had ripened a few fruits of good quality, after which the remaining varieties came in rapidly. It is hoped to raise and plant out some of the above varieties as early as possible next season, and test them against comparable samples of locally raised varieties.

FREEDOM OF SET.

Weather conditions during the setting of the first few trusses were not all that could be desired, and in consequence many of the varieties set rather poorly during this period. The following varieties, however, were practically unaffected, and set freely:—

(1) Daniels' Selected Open-Air.
(2) Riverside.
(3) Early Dawn.
(4) Ailsa Craig.
(5) Kondine Red.

As the season advanced the earlier plants practically ceased growth, whilst some of the main-crop varieties set much more freely.

CROPPING.

Many of the varieties under trial showed promise of heavy cropping capabilities, but the dry weather in the early part of the year gave them a severe check. The subsequent rains stimulated late growth and rapid fruit development, but much

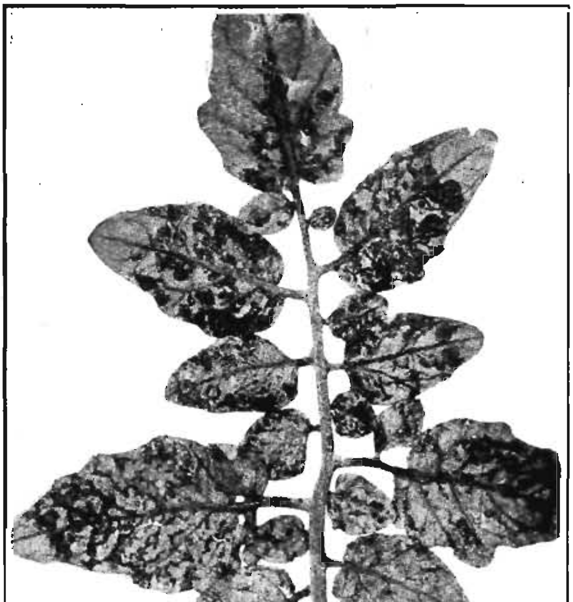


FIG. II.

Leaf showing bronzed areas caused by spotted wilt.

of the fruit did not mature satisfactorily owing to the cold weather. A considerable number also reacted to the sudden access of moisture by cracking and splitting, which rendered them unsightly and unmarketable.

Over the whole season the heaviest cropping varieties were as follows:—(1) Riverside, (2) Bide's Recruit, (3) Blaby, (4) Ailsa Craig, (5) Kondine Red, (6) Selected Open-Air, (7) E.S.2, (8) Essex Wonder.

A few outstanding plants were present amongst other varieties, such as Dobbie's Earliest, and seed was saved from these for later trials.

DISEASE.

No symptoms of disease appeared amongst the plants until early December, when a few became affected with " spotted wilt," and a number by " fernleaf mosaic." These were taken out and destroyed, and measures taken to control aphis and other likely insect carriers, as it is a proven fact that such diseases are largely spread by insects. " Fernleaf mosaic," however, was still troublesome, and by the end of the season some 14 per cent. of the plants had suffered from it; " spotted wilt " was much less prevalent, and amounted to about 5 per cent.

Of the varieties tested, one strain of Ailsa Craig and one strain of Sunrise, and the varieties Comet, Dobbie's Champion, and Golden Eagle, suffered severely. The other strains of Ailsa Craig and Carter's Sunrise, and the varieties E.S.1, E.S.2, Early Dawn, Fillbasket, Selected Open-Air, and Kondine Red, were practically free from any form of disease. Riverside and Blaby suffered to a slight extent, whilst the remaining varieties were somewhat variable. It was noticeable that disease was most prevalent amongst the pruned and staked plants, and though every care was taken in the removal of side shoots, it seems probable that disease may have been assisted by the wounds formed.

SUMMARY.

(1) The most successful varieties from a cropping and general culture point of view are Selected Open-Air, Riverside, Kondine Red, Bide's Recruit. Fairly good crops were also obtained from Blaby, E.S.2, and Ailsa Craig.

(2) Under the free growing type of culture the best varieties were Bide's Recruit, Essex Wonder, and Sunrise.

(3) The most successful early varieties were Dobbie's Earliest, Selected Open-Air, and Early Dawn.

[N.B.—All varieties placed roughly in order of preference for the particular purpose mentioned.]

Seed has been saved from selected plants in the various varieties mentioned as being of outstanding merit, and this will be further tested next season.

Acknowledgment is due to Mr. V. A. Sayer, for raising the plants, and to Mr. F. Street, on whose property the main plot of tomatoes was grown.

FACTORS AFFECTING PASTURE ESTABLISHMENT ON BASALT SOILS IN THE NORTH.

By D. H. MALCOLM, R.D.A., District Agricultural Organiser.

IT is generally recognised that there is considerable room for improvement in the establishment and management of the pastures of the North-West. The peculiarites of the red basaltic soils are a distinct barrier to progress, and until they are better understood rapid progress cannot be looked for.

TYPES OF BASALT SOILS.

These soils vary considerably as to type, but for the purpose of this article the following rough classification might be adopted:—

Type A. 1st-class heavy, chocolate loam. Sedentary.

Type B. 2nd-class light, chocolate loam. Basalt origin. Transported.

Type C. 3rd-class light loam. Transported (myrtle country.)

These three types show very distinct characteristics in their mechanical structure, native vegetation, and natural fertility, and must be dealt with individually when the question of pasture establishment is considered.

The soils comprising Type A usually contain a large proportion of clay, have the subsoil somewhat closer to the surface than the second and third class soils, and are naturally better suited to hold permanent grass. Many of the good chocolate soils, however, are of great depth, and show no definite line of demarcation between soil and subsoil. With soils of Types B and C there is a marked drop in general fertility, and as most of them contain less clay, they are consequently more friable, become very loose with much working, and have to be consolidated before grasses will hold.

Continuous cash cropping, besides encouraging most of the undesirable weeds, has reduced the organic content of many of these soils, so that under present conditions the better grasses will not persist. Other troubles due to the depletion of organic matter are the rapidity with which these soils dry out during a rainless period, and an accentuation of the looseness of texture, particularly on Types B and C. With proper management and a good soil cover, these difficulties can be largely overcome.

If a pasture sown under soil conditions such as have been described is to survive the first prolonged dry spell, it must receive careful nursing in its initial stages in order to get early turf formation and a soil cover that will adequately prevent excessive loss of soil moisture. Heavy controlled grazing should

be carried out as soon as growth permits, the feeding-off being done quickly and thoroughly, and the stock then being removed until grazing is again necessary.

The trampling of stock plays an important part in inducing rapid stooling of the young plants and in consolidating the soil around their crowns. Owing to their effectiveness in this connection, sheep are to be preferred to cattle for grazing young pastures. Considerable care is necessary with this early grazing, and it should be realised that continued light stocking can be just as injurious as overstocking. In the former case the more palatable plants are eaten right down, and often killed, while the remainder of the sward becomes rank and tufty, often running to seed and losing its vigour. On the other hand, the dangers of overstocking are too obvious to need stressing.

Chemically, little difference is found to exist between the three types of soil that have been described. All show a preponderance of iron compounds and a fairly high magnesium content. Phosphates and lime are deficient, and prove a factor inhibiting the growth of clovers and the maintenance of stock health.

Cases can be cited—especially on myrtle country—where applications of superphosphate have failed to give positive results. This can be attributed to the heavy excess of iron and deficiency of lime. When water-soluble phosphates are applied to such a soil, they become insoluble through combining with the iron compounds, and are of little use to plants. If, however, the lime deficiency is made good, the phosphates associate with the lime and remain in a more readily available form. Good results have been obtained from lime on many of our basalt soils, but its present high price makes its use on a large scale of doubtful economic value. Many of the failures of clovers on the lighter soils can be attributed to the factors discussed above. Lack of a consolidated seed-bed will undoubtedly account for some of the failures, but this is largely a matter of sound cultivation methods, and can be readily overcome.

Plant Species Adapted to Soil Types.

An examination of the herbage growing round headlands and roadsides will show the marked difference existing between the species naturally established on the various soil types, ranging from the ryegrass, cocksfoot, and white clover association on the highly fertile land, to Yorkshire fog, silver grass (*Festuca bromoides*), sheep's sorrel, &c., on inferior country. Speaking generally, cocksfoot may be stated to be the dominant grass on basaltic soils. In some cases myrtle soils have been known to become practically sterile after a few years' cropping, and a series of experiments has been inaugurated in an endeavour to discover a remedy for the trouble.

An attempt has been made in the following table to show the various grasses likely to be found growing (naturally) on the soil types described in this article:—

TABLE 1.

Herbage Naturally Established on Basalt Soils.

Type A. 1st Class.	Type B. 2nd Class.	Type C. 3rd Class.
English rye	Cocksfoot	Yorkshire fog
Cocksfoot	Italian rye	Twitches (*Agrostis*)
Crested dogstail	Crested dogstail	Sorrel
Italian rye	Yorkshire fog	Trefoils (very few)
Poa pratensis	Hair-grass	Flat weeds
Timothy	Red clover	Hair-grass
Red clover	White clover	*Festuca Nova Zealandia*
Alsyke clover	Trefoils	
White clover	Sorrel	
Trefoils	Flat weeds	
Flat weeds	Twitches (*Agrostis*)	
Poa trivialis		

Such a classification cannot be made with any degree of exactness, but observation of the herbage naturally associated with the particular soil types will prove a valuable guide to the preparation of a suitable grass mixture. It does not follow that the mixtures necessary for permanent grass should be very complicated. The essence of a good mixture is the inclusion, in sufficient amount, of species certain to succeed and the rigid exclusion of all others.

Where a poor-quality pasture exists it may sometimes be restored by careful management and stocking and efficient manuring. In some districts striking results have been obtained by this method, good pastures being obtained in a year or two with a minimum of expense. Often, however, it is more economical to plough and resow with temporary elements, in order to clean the ground and raise the standard of fertility, and later lay down with a more permanent mixture.

It must be realised that, with the exception of those first and second class soils which have not had their fertility reduced by excessive cash cropping, very few basalt soils are high enough in fertility to carry a permanent sward of grass. The lack of a good subsoil fairly close to the surface is another serious drawback when permanent pasture is considered.

Under existing conditions the temporary or semi-permanent pasture types will be certain to meet with more success. It must be realised that holdings in North-Western Tasmania are small, and that to have a large area under permanent grass would seriously interfere with the rotation usually practised. The question of crop rotation in the north is dealt with elsewhere in this publication, and consequently no further reference is necessary here. Again, not only is the condition of the soil in many instances unsuited to the carrying of a permanent sward of grass, but also the ravages of the grass grubs (which

are usually at their worst in the third and fourth years of the pasture) tend to rule out permanent grass. Up to the present science has been unable to find a means, both efficient and economical, of checking damage from grubs, and the best we can do is to use the short rotation pasture which will reach its maximum yield before the grub causes severe damage. At the same time it should be clearly recognised that losses from this pest can be considerably reduced if more attention is paid to clean, close grazing in the late summer, the use of the mower to remove any tufty patches of grass, and severe harrowing in the autumn. Attention to these points, together with heavy controlled stocking, and the consequent "hoof cultivation," will greatly assist.

For the present it is considered that perennial rye should be sown freely only on those red soils having a good clay subsoil, as on the other types this grass will not hold. It is highly probable, however, that with time and good management the cocksfoot association will give way to ryegrass, but for the present cocksfoot must, in most instances, remain the basis of all permanent mixtures.

The importance of reliable strains of seed cannot be too strongly emphasised. Many failures have been noted as the result of sowing the so-called cheap seed that is available. It should be realised that the difference in cost per acre between good and inferior seed is only a few shillings; certainly not enough to warrant incurring the risk of failure of a sward of grass which otherwise might be expected to last for several years.

MANURING.

In Australia, the wholesale use of superphosphate on both cropping and grass lands has given truly remarkable results, with a tendency towards regarding this as the only profitable fertiliser. It is rapidly becoming recognised, however, that by stimulating crops by the use of one fertiliser, not only is the consumption of that particular element of plant food increased, but all the plant foods are assimilated with much greater rapidity, and it becomes necessary to balance the manures applied to the land.

Under local conditions it has been found that a properly balanced manure should contain both phosphates and nitrogen, and although data is as yet incomplete, it seems that even on our grass land, to get the best results from a *good* pasture, some form of nitrogen is advisable. In connection with the use of nitrogen on grass, there are one or two essentials that cannot be overlooked. The first is the time of application, which in Northern Tasmania should be either in mid-March for late autumn feed, or late July for early spring feed. Another point is that the benefits of nitrogen are most noticeable in the quick, luscious growth that comes away immediately after grazing. If the best results from nitrogen are to be obtained, the grass must be kept short and grazed when young.

In improving grass land it should be realised that proper stocking is just as important as correct manuring, and many

disappointing results from correctly manured land can be attributed to this point. Understocking, with consequent selective grazing, checks the growth of clover, and encourages the less palatable grasses. In many ways overstocking is far less injurious.

Correct and adequate manuring (with possibly an application of lime), and heavy stocking to consolidate the surface soil, are, in the writer's opinion, the most important features of the establishment of grass, whether temporary or permanent, on our chocolate soils. With the lighter myrtle country, a considerable amount of work yet remains to be done in determining the best methods of cultivation and manuring, and the grass association most suited to the particular soil conditions. Before long it is hoped to have definite information available.

The following mixtures can be recommended for use on soil of Types A and B. It will be noted that wild white clover has been omitted from these mixtures, but it will usually be found occurring naturally on those soils which are suited to carry a permanent sward of grass.

TABLE II.

Type A.

Three to Four Year Lea—

	lb.
Perennial ryegrass	12
Cocksfoot	8
Italian or Westernwolths	8
Red clover	4–6
Alsyke clover	2
	34–36

Permanent—
(Soils with good subsoil and high in fertility.)

	lb.
Perennial rye	16
Cocksfoot	10
*Meadow grasses	4–5
Red clover	4
Alsyke clover	2
	36–37

One-Year Lea—

	lb.
Italian or Westernwolths	20–25
Crimson clover	6– 8

* Such as timothy, *Poa trivialis*, crested dogstail, &c., depending on general conditions.

Type B.

Temporary—

One year, as above

Three Years—

	lb.
Perennial rye	5
Cocksfoot	12
Italian or Westernwolths	6
Red and Alsyke clovers	6
	29

Permanent—
(Also for first-class soils of great depth.)

	lb.
Cocksfoot	15
Perennial rye	6–8
Crested dogstail	2
Red clover	4
Alsyke	2
	29–31

Or

	lb.
Cocksfoot	15–20
Subterranean clover	5
	20–25

Although it is obvious to an observer that in many instances sufficient attention is not paid to thorough preparation of the seed-bed for grass, this point has been stressed so often in the past that it will be omitted from this article. It is felt, however, that before closing some reference should be made to the question of the nurse crop, as too often this appears to be of more importance to the farmer than the grass and clovers it is primarily designed to assist.

It must be remembered that the main objects of the nurse crop are (1) to get a rapid cover and afford shelter to the young pasture plants, and (2) to produce a crop that will carry a fair number of stock, so that the surface soil may be well consolidated. With these objects in view, it will be realised that the cover crop is of only secondary importance, and it is entirely wrong to assume that such a crop can be allowed to come to maturity and be harvested without causing serious damage to the resultant sward of grass.

Under local conditions oats are most commonly used, and are almost universally sown too thickly for the purpose. Sowings of more than a bushel and a quarter per acre result in the rapidly growing oats smothering many of the young pasture plants. Those that persist to hay-making time are often so weak and spindly as to have little chance of surviving when the cover is removed and they are exposed to the hot drying winds of summer. The bare patches in a clover field are often the places where the heaviest yield of oats was secured.

Rape is a more satisfactory nurse crop, as it reaches maturity just when the young pasture is most in need of hoof cultivation and the benefit to be derived from the droppings of the grazing stock. Furthermore, when rape is grazed the cover is removed much more gradually than when a crop is cut for hay, thus avoiding the sudden exposure of the pasture to sun and wind. As a nurse crop rape should be sown at from 1½ to 2 lb. per acre.

Italian ryegrass is also used as a nurse crop, and has the added advantage that good strains will persist long enough to occupy the ground until the permanent elements in a mixture have become well established. With the mixtures given above a half-bushel of Italian rye might satisfactorily replace any of the other nurse crops.

TRAINING THE FARMERS OF THE FUTURE.

Some School Agricultural Activities in the South-East District.

C. A. HOLLAND, Dip. Agr. (A.U.C.R.), District Agricultural Organiser.

IT has been truly said that "we are never too old to learn," but this does not minimise the importance of grasping sound principles at as early an age as possible. Knowledge gained, whether at school or in after-life, is of little value unless it is accompanied by that interest which will often turn hard work into pleasure. This fact is fully realised to-day when one meets men who are engaged in farming, and yet have no real interest in the work they are doing.

Hoeing the Maize Crop on Sorell School Plots (1930).

Boys, when reaching the school leaving age, will sometimes stay at home on the farm because they "can't do anything else," while some others will make every endeavour to obtain employment in the towns, where, compared with farm life, work is easier, hours shorter, and more facilities are available for pleasure.

It is with a view to creating interest in agricultural pursuits that officers of the Department of Agriculture are co-operating with head teachers of some schools by assisting with plot work.

This work is usually commenced in a very small way by the sowing of various grasses and clovers of agricultural importance. These are laid out so that the children may become acquainted with the various fodder plants, which, in time, they are able to identify. Also, having followed the growth of the plants from seed to maturity, they are able to make their own observations at various stages of growth.

The first work of this nature to be commenced in the South-East District was at Oatlands, in 1929, by Mr. A. P. Meers, who had carried out similar work very successfully on the North-

West Coast prior to his being appointed to Oatlands. Similar work was commenced last year at Campania by Mr. G. W. Dicken-

Subterranean Clover, Wild White Clover, Crimson Clover, Red Clover, Sheep's Fescue, Poa Pratensis, Hard Fescue, Browntop, Timothy, Perennial Ryegrass, Canary Grass, Meadow Fescue, Chewing's Fescue, *Meadow Foxtail.* (5 rows of each.)		Temporary pastures (grazed). Italian Ryegrass, 25 lb. p.a. Red Clover, 6 lb. p.a. / Italian Ryegrass, 25 lb. p.a. Crimson Clover, 8 lb. p.a.
Path		*Path*
Marlborough Lucerne. Sown in rows, 14 inches apart. 8 lb. p.a. First cut made into hay. Two subsequent cuts taken by boys to feed to stock.		Algerian Oats., 2 bus. p.a. Fed off early, and then cut for hay. 5 lb. of Subterranean Clover p.a. surface-sown after drilling oats.
Path		*Path*
Flax, 80 lb. p.a. This crop was harvested, retted, and scutched, and produced a good sample of fibre.	*PATH*	Sir Douglas Haig Oats, 50 lb. p.a. Scotch Vetches, 70 lb. p.a. Cut for hay.
Path		*Path*
Vegetable garden. Produce sold locally by boys. Return, 14s. 5d.		Wheat, 90 lb. p.a. (Yandilla King.) Cut for hay.
Path		*Path*
Potatoes (Bismarcks). Super., 4 cwt.; Sulp. of Amm., 1 cwt.—p.a. "Seed" from selected plants and dipped. Crop sold. Return, 12s. 6d. 12 cwt. cut "seed" p.a.		Maize (90-day), 40 lb. p.a. Sown in rows, 28 inches apart. Crop sold locally for cow fodder when about 5 feet high. Return, 10s. 6d.
Path		*Path*
Not under cultivation.		Mangolds. (Yellow Globe, Golden Tankard, and Long Red.) 6 lb. p.a. Six selected "Globes" took second prize at Bream Creek Agricultural Show.

son, and at Richmond this year by Mr. C. Gellie, and arrangements are now in hand for plot work to be commenced by other teachers.

Work on a larger scale is being carried out by Mr. A. G. Benjamin at Sorell. With the help of the parents' association a block of land adjoining the school was purchased for £45, and £12 has since been spent on repairs to fences.

The area was divided by paths into plots each one-twentieth of an acre in size, and laid out the first year (1930) as shown on the preceding page.

Manure.—Except where otherwise stated, superphosphate was used at the rate of 1 cwt. per acre, unmanured strips being left for observation.

The grazing which was necessary was done by sheep or cows, procured locally as required. The crops which were cut were made into hay, stacked, and afteryards used for local cows. The mangolds were "clamped" for winter use, as shown in the picture below.

Pitting Mangolds on Sorell School Plots.

At the time of writing (June) this year's crops are looking particularly well, having benefited greatly by the favourable autumn. Permanent grass is following the temporary mixtures, and a rotation is being followed which includes the use of leguminous plants at regular intervals to ensure the building up of the soil, which, prior to being taken over, had been cropped for several years. Periodical instruction has been given in the after-use, as well as the growing, of the crops, and each boy keeps his own account-book, in addition to a note-book, in which all work done and observations made are recorded.

A hive of bees has now been installed, and "winter feeding" is in progress. Samples of drone, worker, queen-bee, and foul brood comb have been secured and handled by the scholars.

The scale of work generally adopted depends mainly upon the number of boys available, but, however small the start may be, it is hoped that every endeavour will be made to create and stimulate that "love of the land" which will lead to the success of our future farmers and our State.

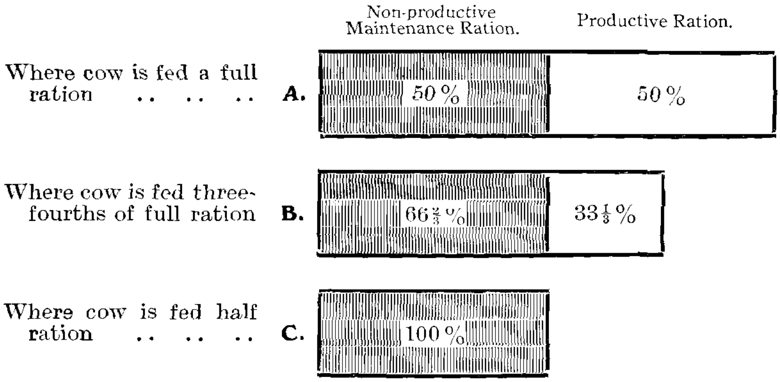
FEEDING OF DAIRY CATTLE.

By A. G. Ritchie, Assistant District Organiser.

It should be the aim of every dairy farmer to keep his cows so supplied with food that production throughout the lactation period will be at its maximum. With adequate feeding it is safe to say that the yield of the average dairy cow in this State could be raised by something like 50 per cent. While the cow is dry she should be so fed as to have her in good condition for the milking season which lies ahead. The poor returns from so many of our dairy herds are in many cases more the fault of the farmer than of the cow. It appears as though many dairymen, through failure to recognise this fact, are likely to be forced out of business by the stress of economic conditions.

Feed a Full Ration.

For maximum production the cow must be fully fed. Of a full ration, the cow needs about one-half to keep herself alive without either gain or loss in weight. This portion is called the maintenance ration. It simply maintains the animal, and yields no profit to the farmer. What is left is available for milk-production. The fallacy of underfeeding may be illustrated in the following manner:—



The case of the half-starved cow is shown in example C. She needs all the food she can get to maintain her normal condition. Nothing is left for production. Any milk produced is at the expense of her body. Consequently, as may be seen in so many of our dairy herds in the autumn, she loses flesh rapidly, and either goes dry or has to be dried off on account of her low condition.

Ration Must Be Balanced.

As well as being sufficient in quantity, the feed of the dairy cow must contain the necessary nutrients (protein and carbohydrates) in correct proportion. The proteins are body-

builders—the source of supply of material for constructing the body cells, for growing muscle, brain, hide, hoof, horns, &c., and for producing milk. In plants protein is found mainly in the young shoots, and, in varying amounts, in such seeds as cotton-seed, linseed, beans, peas, oats, &c.

Forming as it does a relatively small portion of plants, and the proportion varying with the stage of growth, protein is the nutrient most likely to be deficient in a ration.

Carbonaceous foods, that is, carbohydrates and fat, are the source of heat and energy: heat to maintain the body temperature, and energy to carry on the work of the digestive organs, heart, lungs, &c., and of moving from place to place. They are also the main source of the fat found stored within the animal body. Carbohydrates form a much larger proportion of plants than do the proteins, and take a variety of forms. They form the principal part of the fibrous framework of the plant. The sugar in the sugar-beet and the sugar-cane, the starch in the potato, and in such grains as maize, wheat, barley, and oats, are carbohydrates. Fats and oils have a somewhat similar composition, but, from a heat-producing point of view, fats are worth about two and a half times as much as carbohydrates: so that to determine the total digestible carbohydrates in any given foodstuff, it is usual to add to the amount of digestible carbohydrates a sum representing the quantity of digestible fat multiplied by two and a half.

Feeding trials have proved that for best results there should be available in the feed of the dairy cow roughly one part of digestible protein to each six parts of digestible carbohydrates. For the cow in milk this represents a balanced ration, and is described as having a nutritive ratio of one to six.

The nutritive ratio of any food substance may be obtained by the procedure of adding to the percentage of digestible carbohydrates the percentage of digestible fat multiplied by 2·5, and dividing the total by the percentage of digestible protein. As an example, in Maynard's "Australian Dairyman's Handbook" green oats are shown to have the following composition:—Digestible carbohydrates 11·9 per cent., digestible fat ·7 per cent., and digestible protein 2·3 per cent. The nutritive ratio is 1 : 6, obtained as follows:—

$$\frac{11{\cdot}9 + {\cdot}7 \times 2{\cdot}5}{2{\cdot}3} = 6.$$

Only by feeding a ration balanced, or nearly so, can fodder be utilised to the best advantage. In the process of digestion a cow cannot convert carbohydrates into proteins, and only by adding greatly to the work of digestion can carbohydrates be formed from proteins. It follows that either of the nutrients, protein or carbohydrates, may be the limiting factor in the usefulness of any particular ration. An excess of one will not make up for the deficiency in the other.

In balancing rations with the help of published lists of analyses of different foodstuffs, the farmer should realise that the figures as published are approximate only. Though they

represent the composition of a large number of samples analysed, they do not necessarily show the exact feeding value of the fodder a farmer may have on hand. These analyses should be regarded as a starting point from which to begin a series of experiments with his own cows. By watching milk yields carefully he will be able to judge results.

Dry Matter in the Feed.

Another factor limiting the usefulness of feeds is the dry matter they contain. The percentage of water in foodstuffs varies very considerably, ranging from 10 to 15 per cent. in hay, straw, and grains, up to as high as 90 per cent. in turnips and mangels. Grasses, clovers, maize, rape, &c., are intermediate, with a water content of between 70 per cent. and 80 per cent.

The cow is built to handle large quantities of roughage, and can deal with some 25 to 30 lb. of dry matter in her feed per day. An average cow giving 3 gallons of milk requires about 2½ lb. of digestible protein and some 16 lb. of digestible carbohydrates in her ration. Of average mixed grasses and clovers she would need 100 to 120 lb. per day to supply these nutrients. Taking grass and clover as containing 25 per cent. of dry matter, the total quantity of dry matter in her feed would be between 25 and 30 lb., which is within the cow's capacity. With very young and watery grass, as with roots, the percentage of dry matter is so small that the cow cannot consume enough to obtain the necessary nutrients, especially those of a carbonaceous nature. Turnips, for instance, are balanced in composition (nutritive ratio, roughly 1 : 6), but contain only 10 per cent. of dry matter. To obtain 25 to 30 lb. of dry matter from these, a cow would need to consume some 250 to 300 lb. per day, which is not possible.

Supplementary Feeding.

It should be the aim of every dairy farmer to supplement pastures in such a way that the cow will receive as nearly as possible a balanced ration, and so produce to the maximum during the lactation period. In the spring the basis of the ration may be either grass which has been topdressed and saved to provide an early bite, or, failing this, green oats or barley, or a mixture such as oats, Italian rye, and Crimson clover. All of these contain sufficient protein for the milking cow, but the amount of heat-producing material is low, also the percentage of dry matter. This being so, a dry roughage is needed to balance the watery nature of the green feed, and to supply the natural requirement for warmth at this time of the year. For this purpose good mixed grass and clover hay, saved from the paddocks the previous summer, will do very well. Lucerne hay, clover hay, vetch and cereal hay, oaten hay, &c., will all prove excellent.

Green oats, though deficient in minerals, are a balanced ration in themselves, and young grass is rich in protein, so that by feeding a roughage rich in protein, such as clover hay, it is

possible to obtain a ration with rather too narrow a nutritive ratio. It should be borne in mind, however, that in all probability hay on the farm is not so rich in protein as printed analyses show. Hay must be cut at the right time, harvested in perfect condition, and lose very little of its leaf to show a very high protein content. Further, protein acts as a cell stimulant and milk-producer. So long as the nutritive ratio of the feed is not unreasonably narrow, no harm is likely to result. Hence to supplement spring pastures, good-quality hay, fed either on the ground or in racks, will be found very suitable.

Failing an adequate supply of greenstuff for the spring, roots can be fed with good roughage to form a suitable ration. The dry matter in swedes, for instance, is balanced, so that, fed in conjunction with oaten or clover hay, they will prove satisfactory, the roots supplying the succulence which is so desirable in the food of the dairy cow.

During late spring and early summer pasture alone should be sufficient to maintain production at its maximum. In connection with pastures, it must be remembered that for best results there should be a good balance between clovers and grasses, and that short growing grass is richer in protein than grass which has been allowed to become rank. To maintain pastures in good order, topdressing, surface cultivation, and close and rotational grazing must be practised. Paddocks should be suitably subdivided, and the mower used wherever growth tends to get ahead of stock.

In late summer soft turnips, kale, or chou mœllier may be used to supplement dry and stalky pastures which have run to seed; or, again, maize or Japanese millet may be grown. As the latter are both unbalanced, a supplement rich in protein is required. Where a paddock of cowgrass clover is established, by this time the owner should have had a cut of hay off it, and the second growth should be in good order for grazing. To avoid trouble with feed taints in cream, the cows should be run on the clover only for an hour or two immediately after milking. If the cows are hungry, or the morning wet or dewy, a sharp lookout for bloat should be kept. No rules can be laid down as to quantities to be fed. Here, as elsewhere, the farmer must use his own judgment.

Failing greenstuff or turnips, silage from surplus grass and clovers, or from such crops as oats and Crimson clover, oats, and beans, &c., will all prove valuable supplements to dry and scanty pastures. A full supply of the required nutrients will be provided, also the necessary succulence. Some little difficulty may be experienced at first in inducing some cows to eat silage, but in a few days they usually acquire the taste, after which they eat it greedily.

With autumn rains there should be a certain amount of grazing in the paddocks, augmented, where necessary, either by silage or early greenstuff, and supplemented by good quality roughage, such as grass or clover hay. This, again, will counteract the watery nature of the grass or greenstuff and supply the necessary warmth. Where turnips or mangels are on hand they can be fed very successfully with good dry roughage. They

are succulent and palatable, and, being balanced in composition, form, with good-quality hay, a very satisfactory ration.

CONCENTRATES AS SUPPLEMENTS.

The question whether or not it pays to feed concentrates must be decided by the farmer himself, and will depend upon the productive capacity of his cows and the cost of the concentrates, as compared with the price of the extra quantity of milk or butter-fat produced. If a cow is well fed on farm-grown roughages and roots, in all probability she will be producing to her full capacity. Only in the case of cows of a pronounced dairy type is it likely that the increased yield due to feeding concentrates will warrant the extra expense. However, it is only by experiment that this matter can be determined.

When concentrates are fed the farmer should have a fairly accurate knowledge of the composition of the roughages supplied to his cows, and, using this as a basis, should select concentrates of a feeding value that will form, with the roughages, an approximately balanced ration. If the protein content of the roughages is likely to be high, concentrates rich in carbohydrates can be used to effect a balance. Maize (nutritive ratio, 1 : 10), wheat (1 : 8), barley (1 : 7), or a mixture of any of these, might be used to advantage.

On the other hand, if only roughages low in protein are available, protein rich supplements must be used to correct the deficiency. Cottonseed meal or linseed meal (nutritive ratio 1 : 2), peameal (1 : 3), bran (1 : 4), or oats (1 : 6) may be used alone or mixed in varying proportions to correct a protein deficiency. For instance, a good mixture frequently used is as follows:—By weight, 5 parts bran, 4 parts crushed oats, 1 part linseed meal, nutritive ratio between 1 : 5 and 1 : 6. If thought too narrow, the ratio can be widened by substituting maizemeal, crushed wheat, or crushed barley, wholly or in part for the crushed oats. For general purposes the following mixture may be fed:—By weight, 1 part ground barley, 2 parts crushed oats (nutritive ratio between 1 : 6 and 1 : 7). The use of this is recommended on the ground that it is capable of being produced on the farm. The aim should be to make maximum use of home-grown foodstuffs. For heavy producing cows it is advisable to include a certain amount of bran in the grain mixture. Though deficient in lime, it is palatable and easily digested, has a laxative action, and adds bulk without undue weight. Concentrate mixtures should not be too heavy. One weighing about 1 lb. to the quart has been found to give the best results. At first only a small quantity of grain mixture should be fed, and the amount increased till the point is reached where the cow ceases to respond profitably to the concentrates fed.

MINERAL MATTER.

In compounding rations the mineral requirements of the dairy cow must be kept in view. In addition to the lime and phosphorus needed to develop and maintain the bony skeleton, a

relatively large amount is required for milk-making. Of normal milk, mineral matter forms about ·7 per cent., roughly one-fourth of which is lime. If the case of a milking cow giving 50 lb. daily be considered, the large amount of lime secreted in the milk will be realised. When given food lacking in mineral matter, the cow, in her endeavour to produce normal milk, will draw on her own system for the necessary lime, and it has been estimated that in this way a cow will give up as much as one-fourth of the lime in her body, including the skeleton. Where lime deficiency exists it leads to brittle and porous bones, and is frequently the cause of such troubles as abortion, dead calves, and failure to breed. Generally speaking, clovers and rape are rich in lime, and most of the seeds fairly so, while the straws and grasses are relatively low. On this account the clovers are specially valuable fodder crops, the growth of which cannot be too strongly recommended. High in feeding value and rich in lime, they also enrich the ground in which they are grown.

Where trouble results from mineral deficiency the feeding of sterilised bonemeal will prove advantageous. If hand feeding is practised, the bonemeal may be mixed with the feed at the rate of two to three ounces per cow per day. A better plan is to have available at all times the stock lick recommended by this Department. In addition to bonemeal it contains salt, which is necessary for the milking cow. The average cow requires about an ounce of salt a day, and heavy milkers an even larger amount.

WATER.

At all times a good supply of clean fresh water should be available. Apart from the fact that cream contamination may be traced directly to impure water, the production of cows is often seriously reduced simply because they cannot conveniently get plenty of fresh water. Considering that 87 per cent. of the milk consists of water, it is evident that the daily requirement must be large; some 10 to 12 gallons a day for the average cow, and much more in the case of heavy producers. Naturally the quantity consumed is greater in summer than in winter, and greater, too, when on dry feed than on green feed; but it is false economy not to arrange matters so that a plentiful supply is readily available at all times.

For the guidance of farmers interested in scientific feeding the following text-books are recommended:—

"Feeds and Feeding," by Henry and Morrison.

"Feeding of Dairy Cattle," by A. C. McCandlish.

"Australian Dairyman's Handbook," by R. S. Maynard.

THE DATE AND DURATION OF THE WINTER SPORE DISCHARGE OF BLACK SPOT.

By H. A. TURNER, Horticulturist, and W. J. DOWSON, Plant Pathologist.

THE spraying programme for black spot in Tasmania, and probably in Europe, has been evolved by the method of trial and error over a number of years. The present practice of applying a spray at the late dormant (green tip) stage has undoubtedly led to most beneficial results (see Bulletin No. 116, "Black Spot Control," 1925). In the apple-growing States of North America, however, the disease—scab, as it is there called—has been much more intensively studied.

The present article is due to the result of work carried out locally, but based on the American plan. American horticulturists were the first to discover when and for how long the spores of the parasite were liberated from fallen leaves, and adapted their spraying accordingly. Over a number of years they have shown that spore discharge depends to some extent upon the previous season; for instance, if the leaves hang on the trees longer than usual in autumn, spore discharge in the following spring will also be delayed. The discharge may start at the green tip stage of early apples in some districts, whilst in others in the same year the first spores are not emitted until the calyx stage of the blossoms. Under such conditions a spray applied at the pink bud stage would have been too late in one place and just right in the other. This difference in time of discharge varies from season to season, according to the climatic conditions of rainfall and temperature experienced, not only in spring, but also in the preceding autumn.

With the object of finding out when the discharge of spores takes place in Tasmania and for how long it is continued, the following preliminary observations and experiments were carried out at Launceston last winter. On 20th August, 1930, a handful of Cox's leaves were collected at random at Freshwater Point, and brought to the laboratory for examination, when it was found that every single one bore the dormant or winter stage of the black spot fungus, *Venturia inæqualis.* Further microscopical examination showed that the fungus was as yet immature and that the spores were not ripe for discharge. The fact that every leaf bore signs of the fungus was somewhat surprising, and it was decided that further specimens, all taken at random, should be examined. A further lot of leaves of different varieties was collected at Lilydale on the 23rd August, and examined at once. As in the previous case, all leaves except two were found to be more or less covered with the winter stage (perithecia) of the black spot fungus. Further collections all showed the same state when examined, in spite of the fact that during the preceding season (1929-30) black spot had not been particularly bad.

The discovery, however, bears out what had been previously observed, namely, that a light visitation of the disease one season

does not necessarily mean a light attack the following season, and *vice versa*.

Whatever the explanation may be, the practical results are obvious and of no small importance. Irrespective of the state of the leaves in autumn, in the succeeding spring practically all of them will bear black spot, and so become potential sources of infection.

On 22nd August five Cox's leaves and two pear leaves were laid on the ground in the open at Launceston. The top surface of each leaf was uppermost, and just above each was supported on match sticks a small slip of glass (a microscope slide, measuring 3 inches by 1 inch), smeared with glycerine on the side nearer the leaf. In the event of spores being discharged from the winter stage (perithecia) of the black spot it was expected that they would be caught in the glycerine on the slides. The slides were changed daily at first, and examined under the microscope, but later, when it was discovered that the spores were only emitted after heavy rain, the glass slides were not changed in dry weather. It is necessary in this place to give only the more important findings of this experiment in so far as they affect orchard practice, especially spraying.

On the 22nd August, when the leaves were put out with their accompanying slides, the spores were immature, the weather was sunny, and remained fine until the 27th, on the night of which heavy rain fell, and continued all the next morning. Later in the day, the 28th, the slides were examined, and found to be covered in parts with numerous winter spores (ascospores) of black spot. Fresh slides were placed over the same leaves, rain fell during the day of the 29th, and spores were again found on the slides when examined on the 30th. The weather remained fine till the early morning of the 8th September, and no more spores were found until this date. Rain fell again at night, and spores were again present on the new slides examined on the 9th September. On this date the first discharge of pear spores (*Venturia pirina*) was found. Thus the pear spot fungus had developed and matured about ten days later than that of apple under similar conditions; and it may be stated that, for the Tamar orchards, by the 27th August black spot spores of apple were in the air, and by the 8th September both pear and apple spot spores were abundant. That the spores were quite mature and ready to infect young leaves was highly probable, for when examined on the slides a large number of them had already germinated.

The examination of the slides placed above the same leaves was continued until the leaves finally became disintegrated, mostly by the action of slugs, early in December (8th). The results were always the same, and may be summarised as follows:—When very little or no rain fell, no spores were discharged; after rain sufficiently heavy to thoroughly wet the leaves, spores were emitted within a few hours. During the three months of the experiment spores were emitted on sixteen separate occasions, ending with the 8th December, and it is probable that had the leaves lasted longer the spore discharge

would also have continued. The exact duration of winter spore discharge has thus not been ascertained, but that it goes on for quite three months *from the same leaves* the above observations make quite clear. Further observations are needed to gain information on this point, and it is hoped to carry out similar and more complete experiments this (1931) spring.

At this point, in order to enable the orchardist to combat black spot in as economical and efficient a way as possible, it may be advisable to interpret these findings. In the first place, the orchardist may assume with confidence that towards the end of August practically every fallen apple and pear leaf will be *covered* with the winter spore form of black spot, ready to eject spores during and after the first heavy fall of rain. In the second place, each and every leaf, once it has commenced to discharge spores, will continue to do so for at least three months, perhaps longer, unless destroyed or buried. This spore discharge in 1930-31 commenced *before* the dormant or green tip stage (third week of September) of the majority of apple varieties, and at the pink bud stage of most pears. At the last discharge recorded the fruit was well set (8th December), and in between whiles fourteen discharges had taken place during and after wet weather. The infection which took place at any one of these fourteen discharges is said to be primary, as it results from winter spores.

It will be desirable at this point to draw attention to some practical results following recent similar investigations in North America. In many of the apple-growing States, where black spot is just as serious a menace as it is in Tasmania, investigators have found that the spore discharge does not take place at the same rate, but varies, not exactly according to the rainfall, but to the age of the fallen leaves. By measuring the rainfall at the spot where the slides over the apple leaves were located and by counting the spores on each slide on every occasion when discharge happened, it was found that the number ejected into the air at the commencement is relatively small compared with subsequent emissions. American observers have found that the quantity—that is the intensity—of discharge, rapidly increases until a maximum is reached at about the open cluster stage of most apples, and then slowly dies down, until it finally ceases after about three months (the duration of spore emission appears to be the same as in Tasmania).

It may perhaps help apple and pear growers to realise what goes on in spring and early summer amongst their trees by likening the fallen leaves of last year to an army with numerous artillery about to attack an opposing force; in this instance, the young developing leaves of the trees above. The bombardment is at first weak and spasmodic, but gains in intensity until, with the advent of rain during the open cluster stage, the air within an orchard is packed with tiny missiles—the ascospores—ready to stick to any unprotected surface. The bombardment then dies away very slowly, and ceases altogether after about three months. In the meantime, however, this prolonged artillery attack, i.e., the primary infection, has pre-

pared the way for a most efficient secondary attack by means of the rapidly forming summer spores (conidia), which produce secondary infection. How the secondary attack follows so rapidly from the "artillery bombardment" a few words will make clear. Wherever a winter spore (ascospore), shot from the fallen leaves, lodges on a suitable young leaf or fruit, at that point a minute disease spot—the incipient black spot—is produced. The disease area slowly enlarges, but, long before it becomes visible to the naked eye as a minute dark blotch, secondary or summer spores (conidia) are produced on its surface in some quantity, but are not dispersed by wind. They remain on these diseased areas until rain falls, when they are easily detached and washed on to surrounding parts; it may be a bit lower down the parent leaf or fruit, or even on to other leaves and fruits. Again let it be noted that the dispersal of the spores is brought about by rain, without which neither the fallen leaves can discharge their spores nor the incipient black spots part from their crop of secondary spores.

The summer spores behave in much the same way as the winter spores, and, should they be washed on to a susceptible part of apple or pear, within a few hours they germinate, invade those parts, and produce another—a secondary—disease area, an incipient black spot, which repeats the process. Crops of summer spores are formed long before the spot is visible, and rain will disperse the spores as before. It will be seen, therefore, that once black spot is successful in bringing about primary infection by its winter spores, the opportunities for spread are enormously increased by the rapid development of its summer spores. After the first week or so following winter spore discharge, the leaves and young fruits are subject to a continuous bombardment of winter spores, assisted by ever increasing numbers of summer spores. As the bombardment of winter spores grows less, the attack is increased by the summer spores, and is carried on until the very end of the season.

The most susceptible stage for the tree is from closed to open cluster, for should winter spores alight on the young calyces, the summer spores formed on these incipient and invisible spots are readily washed down to the young ovaries of the flowers, where they produce the first and most serious spots on the fruit. It is the chief object of the orchardist to apply his spray at such times as to prevent primary infection from taking place, for this automatically prevents the deadly secondary infection of the fruitlets. Unfortunately, however, the leaves, flowers, and fruits are continually enlarging, so that a surface which was adequately covered by a protective layer of spray a week or so ago is now only a portion of what is exposed to the incessant bombardment of winter and summer spore.

It says much for the efficiency of spraying in this State that, on the whole, so little *early* infection takes place, and the problem now seems to be how to prevent late summer infections.

It is not proposed to enter deeply into spraying problems in this article, but one or two practical points may be empha-

sised in connection with this matter. The first is that everything possible should be done to bury the fallen leaves *before* green tip stage. The second is to leave the ground without subsequent cultivation for as long as possible, i.e., once having turned in the leaves, they should not be disturbed until at least two sprayings have taken place. The third is to spray early, commencing not later than the green tip stage, and to follow this up so as to get a further coat on between the time of open and closed cluster.

The attention of readers is directed to the report on the new "carbide" spray on another page of this journal.

The life history of the two *Venturias* in Tasmania has been described and illustrated in Bulletin No. 48, "The Black Spot of the Apple and Pear" (1913).

A NOTE ON THE WOOD INFECTION OF PEAR BY BLACK SPOT.

In Tasmania there is one very striking difference between the black spot of apple and that of pear, and that is the attack on the wood of pear by *Ventura pirina* which leads to an infection of black spot in late summer.

During an investigation of the late spot infection of pears, in every instance carefully investigated it was found that a good deal of last year's wood bore black spot markings. In some, infections were traced back to three-year-old wood. Where black spot was bad among pears last season (1931), many of the current season's shoots will be covered with black spot. By realising the importance of this kind of infection it is hoped that orchardists will be induced to take great care to prune out such shoots.

The spots take the form of small black blisters, about 1-8th inch across, either scattered along the shoot or massed together at the base of this year's wood. On second and third year wood the blisters have expanded into small roughened cankers, black in colour. The small blisters on the current season's shoots will become active next summer, and will then produce crops of numerous summer spores (conidia). These are detached only during rain, when they are washed on to surrounding leaves and young fruits, there to produce the well-known "black spots." It is to be noted that by December most of the spraying designed as a protection against the winter spore infection is over, and therefore these summer spores, produced on the shoots, find a considerable surface of fruit and leaves unprotected. Hence a late attack of black spot is noticed soon afterwards.

By far the best remedy for this kind of infection is to prune out current year's growth bearing spot infection, even though it means sacrificing some fruit wood; but it is not necessary to cut out all the infected wood of two and three years ago.

—*Plant Pathologist.*

SULPHATE OF AMMONIA ON CEREALS: SEASON 1930-31.

By R. J. VEALE, Dip. C.A.C., B.Agr., Agronomist.

URING last season, with the object of determining the effect n cereal crops of nitrogen applied in the form of sulphate of mmonia, four trials were conducted in the Longford-Evandale istrict by the Agronomy Division of the Department.

Single top-dressings of sulphate of ammonia were applied in the spring to crops of wheat, barley, and white oats at the rates of 0, ½, 1, 1½, and 2 cwt. per acre. The trials were laid out in the form of 25 plots, allowing for five replications of each treatment in every trial.

The results are important, because in all cases they show the great need of nitrogen plant food. In three cases out of four a very definite response to fertiliser was shown, and in view of this fact further investigations on the use of sulphate of ammonia and other plant foods will be undertaken.

The details of the various trials are as follows:—

WHEAT.

This trial was conducted on the farm of Messrs. Young Bros., Wilmore's Lane. The soil was a grey loam, and had been cropped for several years in succession. It was underlaid by a hard pan, making it subject to waterlogging in wet weather. The land was also weedy. The basic treatment for all plots in this trial was 90 lb. superphosphate and 90 lb. seed per acre.

Shortly after the application of the manure the effect of the nitrogenous top-dressing was evident in increased growth and darker green foliage on the manured plots, which remained outstanding during the season. At any time the different rates of manuring could be detected by the proportionate increase in growth.

The following tables and graph indicate the low yields obtainable from average quality land suffering from poor drainage and continuous cropping.

Plan of Trial, with Weights of Grain and Straw in Lbs. per Plot of 1/40th Acre.

NORTH.

Column	1	2	3	4	5
Row 1	E 16·2 46·4	B 8·2 30·7	C 9·5 30·9	A 4·9 25·4	D 9·9 37·9
2	D 13·4 40·2	E 20·0 51·1	A 6·6 23·1	B 6·2 22·3	C 9·8 30·1
3	A 7·5 21·8	C 9·3 30·2	E 9·2 28·0	D 7·0 27·2	B 5·2 21·1
4	C 10·5 29·0	D 9·8 30·2	B 7·0 21·2	E 9·0 35·3	A 5·5 22·8
5	B 9·0 24·8	A 6·6 19·7	D 12·2 32·8	C 7·5 22·1	E 10·6 34·9

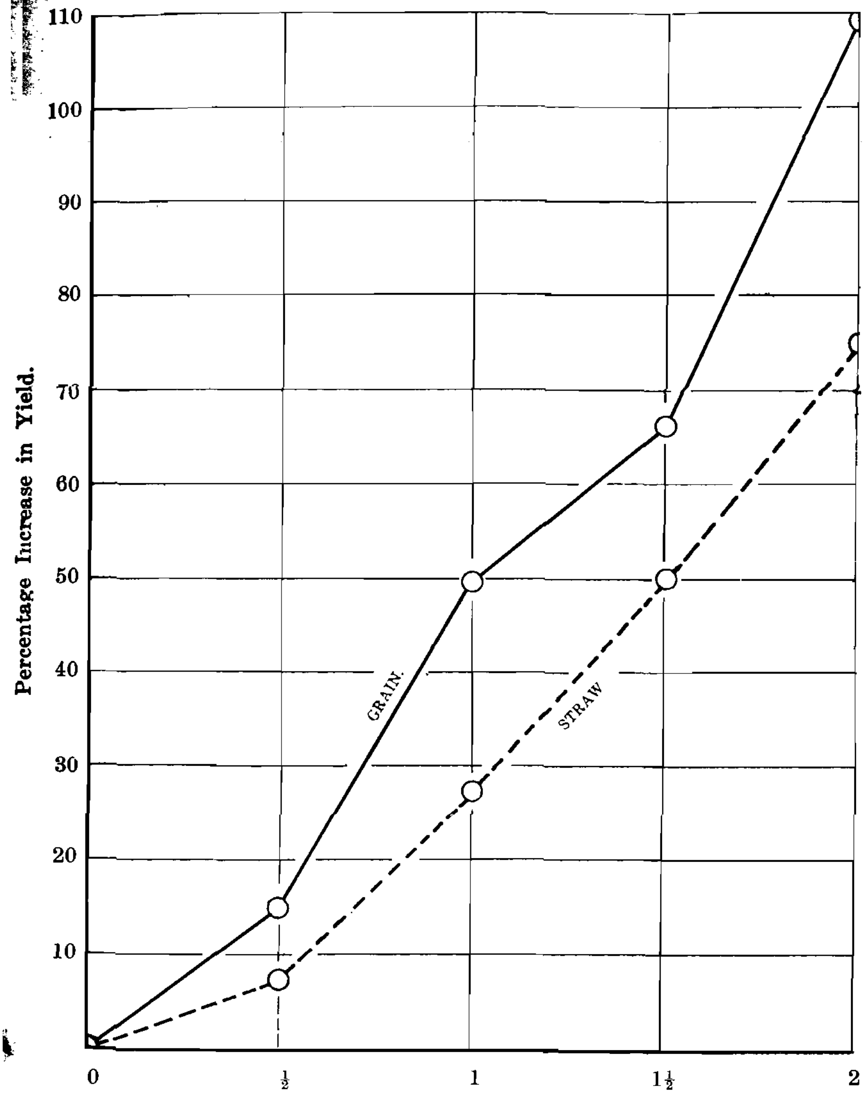
Key to Rates of Application.

Treatment.	A	B	C	D	E
Sulphate of Ammonia, Cwt. per Acre.. ..	0	½	1	1½	2

Summary of Results.

Application in Cwts. per Acre.	Grain (in Bush.). Yield.	Grain (in Bush.). Increase.	Cost of Manure, @ £14 per ton.	Value of Increase. 10 Years, Average Price = 6s.	Value of Increase. Price at March 31, 2s. 6d.	Significance.
			s. d.	s. d.	s. d.	
0	4·15	0	—	—	—	—
½	4·75	·6	7 0	—	—	Not significant
1	6·21	2·1	14 0	12 7	5 2	Significant
1½	6·97	2·8	21 0	12 10	7 1	Significant
2	8·67	4·5	28 0	27 0	11 3	Significant

Graph No. I.—Wheat Yields.



Although a 100 per cent. increase in grain yield was given by 2 cwt. of sulphate of ammonia, the poor condition of the soil and the low yield prevented a payable increase from being obtained. It is asking a great deal of a fertiliser to expect it to show to advantage on this type of land, and the results indicate that a fertility-building process is needed before the maximum benefits can be derived from sulphate of ammonia.

The basic action in restoring the fertility will be to initiate a system of drainage or subsoiling, followed by fertility-building

practices, such as growing of legumes and forage crops, rotation of crops, and periodical laying down to pasture.

A glance at the accompanying graph will show that by the use of 2 cwt. of fertiliser we have not yet supplied the total requirements of nitrogen, and it is probable that by heavier dressings the yield will be still further increased.

These results are from only one season's investigations, on one type of soil, which, although definitely lacking in nitrogenous plant food, has not in its present condition shown a profitable return when sulphate of ammonia was chosen to supply the need.

OATS.

This trial was laid out on the farm of I. C. Boyes, Esquire, of Longford. The soil was of alluvial type subject to occasional flooding. The treatments were similar to those on wheat, and white oats were drilled at the rate of 3 bushels per acre, with a basic manuring over all plots of 180 lb. of superphosphate per acre.

The fertiliser was applied shortly after the crop appeared, and the effect was not very outstanding during the growth of the crop. The plots top-dressed at the rate of 1½ and 2 cwt. per acre could be distinguished by their being slightly taller and darker in colour than the non-manured and lightly manured plots.

Their stronger and drier straw made the 1½ and 2 cwt. plots more noticeable during the cutting of the crop, which had broken in the straw. This defect was particularly noticeable on the 0, ½, and 1 cwt. plots, whereas the percentage broken was decidedly less with the heavier dressings.

Plan of Trial, with Weights of Grain and Straw in Lbs. per Plot of 1/40th Acre.

NORTH.

Column	1	2	3	4	5
Row 1	C 32·0 89·6	B 30·5 86·9	D 34·6 96·7	A 31·4 72·9	E 34·6 102·8
2	A 29·9 74·4	E 35·6 115·3	C 30·5 83·6	B 31·9 58·2	D 40·3 104·9
3	B 27·2 73·5	D 32·3 89·8	A 24·5 52·6	E 35·9 101·0	C 35·0 86·7
4	D 32·6 79·2	A 24·8 54·5	E 38·0 96·1	C 34·5 80·0	B 33·8 68·8
5	E 33·2 101·8	C 32·4 77·6	B 28·9 69·7	D 34·5 99·9	A 29·3 66·6

Key to Rates of Application.

Treatment.	A	B	C	D	E
Sulphate of Ammonia, Cwt. per Acre.. ..	0	½	1	1½	2

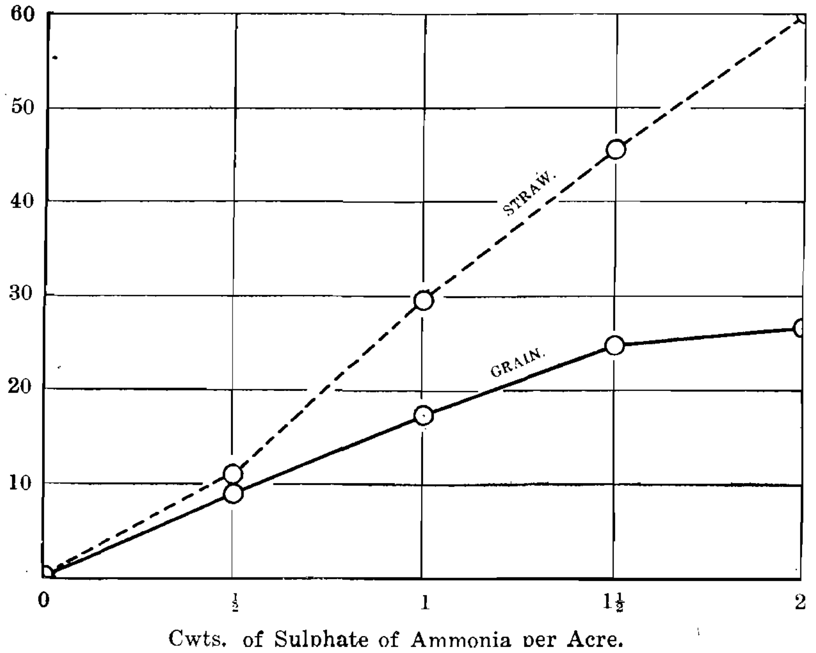
Summary of Results for Grain.

Application in Cwts. per Acre.	Grain (in Bush.).		Cost of Manure, @ £14 per ton.	Value of Increase.		Significance.
	Yield.	Increase.		10 Years, Average Price = 3s. 9d.	Price at March 31, 1s. 9d.	
			s. d.	s. d.	s. d.	
0	28·0	—	—	—	—	—
½	30·5	2·5	—	—	—	Not significant
1	32·9	4·9	14 0	18 5	8 7	Significant
1½	34·9	6·9	21 0	25 11	12 1	Significant
2	35·5	7·5	28 0	28 1	13 2	Significant

Second Summary for Hay.

Application in Cwts. per Acre.	Hay (in Tons).		Cost of Manure at £14 per ton.	Value of Increased Price—		Significance.
	Yield.	Increase.		@ 35s.	@ 30s	
			s d.	s. d	s. d.	
0	1·65	..	—	—	—	—
½	1·82	0·17	—	—	—	Not significant
1	2·08	0·43	14 0	15 0	12 10	Significant
1½	2·30	0·65	21 0	22 9	19 6	Significant
2	2·48	0·83	28 0	29 0	24 10	Significant

Graph No. II.—Oat Yields.



The results show a definite response to nitrogen, and as the yield is still increasing when 2 cwt. of sulphate of ammonia is applied, the "saturation" point has not been reached by this amount. A still further increase is probable from a heavier dressing.

At the present price of white oats (1s. 9d.) the trial has shown a loss on each quantity of manure, but considering the average price of the last 10 years the dressings of ½, 1, and 1½ cwt. of sulphate of ammonia show a margin of profit, particularly so in the case of 1 and 1½ cwt.

Although a heavier dressing than 2 cwt. may give a further increase in yield, it does not appear that it would be profitable to use more fertiliser unless it was desired to increase the bulk of straw for hay purposes. A summary of the yields and prices of hay is included in the tables of results for this trial.

BARLEY.

A trial with barley was also conducted on Mr. Boyes' farm, on a similar type of soil, and in the field adjoining that of the oat trial. A similar series of dressings was applied, and the basic treatment of the crop was 1½ bush. seed and 180 lb. superphosphate per acre.

From the beginning the crop was thin and light, and the smaller dressings of fertiliser did not show up. As in the case of the oats, the plots receiving the heavier dressings of 1½ and 2 cwt. were distinguishable during the growth of the crop.

Plan of Trial, with Weights of Grain and Straw in Lbs. per Plot of 1/40th Acre.

NORTH.

Column	1	2	3	4	5
Row 1	D 28·5 48·3	C 30·4 39·8	B 21·1 34·0	E 34·5 62·4	A 25·2 40·9
2	E 29·1 48·5	D 32·4 56·2	A 24·1 37·5	B 25·4 50·1	C 36·3 58·8
3	B 32·1 51·7	E 38·1 75·3	C 30·5 55·9	A 25·6 49·7	D 41·8 69·3
4	C 30·3 50·5	A 24·7 44·2	E 36·4 67·0	D 33·3 61·7	B 30·8 51·2
5	A 25·4 41·3	B 27·1 42·5	D 30·6 51·1	C 26·2 47·2	E 33·6 54·3

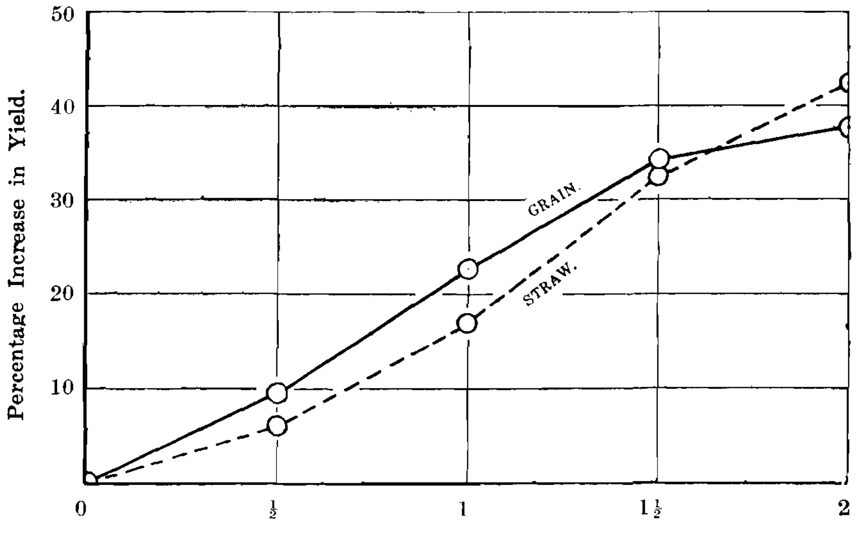
Key to Rates of Application

Treatment.	A	B	C	D	E
Sulphate of Ammonia, Cwt. per Acre	0	½	1	1½	2

Summary of Results.

Application in Cwts. per Acre.	Grain (in Bush.).		Cost of Manure, @ £14 per ton.	Value of Increase.		Significance.
	Yield.	Increase.		10 Years, Average Price = 4s. 8d.	Price at March 31, 3s. 8d.	
			s. d.	s. d.	s. d.	
0	20·0	—	—	—	—	—
½	21·84	1·8	7 0	—	—	Not significant
1	24·59	4·6	14 0	21 2	16 10	Significant
1½	26·66	6·7	21 0	29 7	24 6	Significant
2	27·47	7·5	28 0	34 6	27 6	Significant

Graph No. III.—Barley Yields.



With the 1931 price for barley at 3s. 8d., a small profit is shown by the use of 1 and 1½ cwt. of fertiliser.

The saturation point for nitrogen plant food was not reached by the 2 cwt. of sulphate of ammonia, but it does not appear that any increased quantity will show as great a profit as has been given by 1½ cwt. of fertiliser.

A second trial with barley was also conducted on the farm of Mr. F. Chugg, of Western Junction, on a black loam soil in an excellent state of fertility. Owing to the introduction of

an experimental error, no reliance could be put in the results from this trial, and it had to be abandoned.

Thanks are due to Messrs. Boyes, Chugg, and Young Bros. for their help and co-operation, also to Nitrogen Fertilisers Pty. Ltd. for donations of fertiliser.

General Comments.

Results obtained in any one season on a limited number of holdings cannot be regarded as conclusive or of general application. So far as they go, these trials confirm the opinion that nitrogen is deficient in our soils, but although increased yields are obtained when artificial applications of nitrogen are made to cereals, these increases are not profitable at existing prices.

In general, the wider adoption of the practice of growing increased acreages of forage crops, clovers, and mixed pastures seems to offer the most economical means of increasing the nitrogen content of our arable soils, and of raising their standard of fertility.

SALT POISONING.

Of the domesticated animals, pigs and fowls are most susceptible to poisoning by common salt (sodium chloride), and quite a number of mortalities have been recorded in this State through pigs and fowls gaining access to salt, brine, or salted meat.

The symptoms in the case of pigs are as follows:—Loss of appetite, thirst, sometimes diarrhœa, giddiness and blindness, loss of power of hind-quarters, ears and skin cold; and death takes place in convulsions within about three days.

Fowls show thirst and weakness, difficulty in walking, and finally inability to stand.

The post-mortem appearances are those of inflammation of the intestinal canal. The blood-vessels in the brain are injected; the blood clots rapidly, and is of a dull-red colour. It has been proved that 25 grains per lb. of body weight of salt will kill poultry. Treatment of the smaller animals is not likely to be very effective, as their condition is not often noticed in the early stages. In pigs an emetic, such as mustard and water, may be given, followed by milk, white of egg, and paregoric 1 dram, ether 1 dram.

—*Veterinary Division.*

CONCRETE.

Its Place in Farm Improvement—(1).

By R. H. BEVIN, Dip. C.A.C., B.Agr., District Agricultural Organiser.

AT present there is a call for improved hygienic conditions in the dairying industry, particularly in regard to milking-sheds on the farms.

It is generally recognised that to build a really good sanitary shed the place to begin is with the foundations and floor, and it is in connection with the laying down of these in concrete that this article will deal. It is hoped to follow on with later articles dealing with other types of structures, such as troughs, posts, silos, &c.

MATERIALS.

1. *Gravel.*—Before commencing on any extensive work of this nature, the primary consideration is the location of suitable gravel with which to work. In general, such gravel should be of reasonable size (any stones over 2 inches long are on the big side for fine work) ; it should be free from vegetable matter, and should contain a fair percentage of sand and finer particles. Gravel in river-beds usually fulfils these conditions, but at times the addition of sand is necessary. Screening of such gravel leaves the material admirably suited for the work. On a lot of our peppermint country suitable ironstone and quartzite gravels occur; but with these care should be taken to remove the overburden of soil to a depth of 12 to 18 inches, as otherwise there is a tendency to have too much vegetable matter, which after a few months, owing to decay, renders the concrete short or brittle. Where it is not possible to get material free from this vegetable matter, washing in a trough may be resorted to. This enables the clean gravel to be separated out. If screening of material is necessary, this should be done at the gravel-pit, in order to save cartage of waste material.

2. *Cement.*—It is important that this should be obtained from a reliable source, as old bags of cement deteriorate if they have been exposed to the weather. At any time it is not advisable to buy more than will be required for the particular work in hand. All cement should be stored under cover in the driest conditions possible.

3. *Water.*—For mixing, a supply of clean water should be available. The presence of clay or vegetable matter in it is harmful to concrete.

4. *Boxing.*—For all concreting it is necessary to use wooden walls for moulds, &c. The most convenient timber for the purpose will depend on the nature of the work to be done, and must be left to the discretion of the individual. Where possible, moulds should be made to a standard size throughout the job, so as to avoid undue cutting up of timber.

5. *Tools.*—For farm work it is not necessary to have an elaborate set of tools and equipment, but the following are recommended:—

2 square-mouthed long-handled shovels.
1 mixing-board, 8 ft. x 8 ft., of 6 in. x 1 in. T. and G. pine or hardwood boards, nailed to a solid 3 x 2 frame.
1 trowel.
1 wooden float, 9 in. x 4 in.
1 tamping-rod (or rammer).
1 12-ft. straight-edge.
1 2 ft. 6 in. or 3 ft. spirit-level.
2 dozen or more 3 x 1 pegs, 12 to 18 in. long.
3 or 4 kerosene or petrol tins.

LAYING THE FLOOR OF A COWSHED.

Having decided on a well-drained and otherwise suitable site, the procedure should be as indicated below.

When levelling, determine the line of the back wall by means of pegs driven into the ground at 10-feet intervals; the straight-edge and spirit-level should be used along the top of these pegs, which should be driven to correspond with the

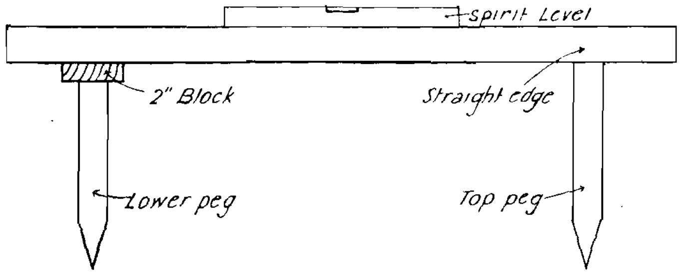


FIG. I.

height of the wall-plate foundation. This should be at least 8 inches high over the excavation bottom to allow the wall-plate to be a few inches above the finished floor.

The next step is to peg out the position of the drain behind the bails. This need not be more than an inch deep at the top end and 2 or 3 inches at the bottom end. The fall of the drain should be about 1 inch in 5 feet, and in a long shed this can be provided for, without unduly deepening the drain, by increasing the slope of the floor from the wall-plate to the drain at the lower end. To get the height of the pegs for the drain-wall boxing, start at the top end, and set out pegs 10 feet apart right down the line. Now place the straight-edge on top of the upper peg at one end, and on top of a 2-inch piece of timber on the lower peg at the other end. Adjust lower peg until level is reached. The method is illustrated in Fig. I. This method is continued right along the line.

The same method is adopted is setting out the foundation for the whole floor, where the fall is from the back wall of the

shed into the drain on the one side, and from the front to the drain on the other. It is important to note here that the straight-edge must be true, and check levels should be taken by turning it upside down occasionally.

The wall foundation should be not less than 8 inches high. The floor itself need not be more than 5 inches thick, half rubble and half concrete. This leaves a 3-inch concrete flange around the walls, so that the plate itself is clear of wash-water, &c.

Concrete should not rest directly on the subsoil, and certainly not on turf, as rotting of the latter will cause the floor to crack. A layer of rubble or coarse gravel, 2 to 3 inches thick, well rammed, should be put down first, and the concrete

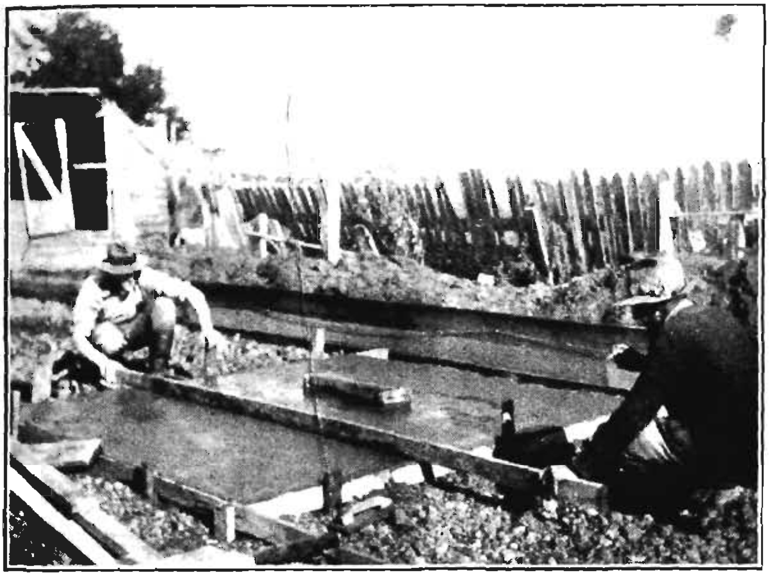


FIG. II. [*Photo. by R. H. Bevin.*

Showing the arrangement of boxing, rubble in position for foundation, method of working levelling beam, and placing of foundation for uprights. Wooden float may be seen on rubble in foreground.

laid on top of it. The floor is best laid in sections, each of which can be made to correspond with a pair of bails. It is convenient to lay alternate sections, and, when these have set, fill in the remainder, at the same time making provision for expansion joints.*

For the type of floor we are discussing, 4 in. x 1 in. hardwood boxing will do, with pegs driven into the ground on the outside every 2 feet 6 inches. These pegs must be in line, and

* Concrete expands and contracts with temperature variations. Where a large area is laid in one piece, expansion often causes cracking. This can be avoided by letting in a thin lath, $\frac{1}{8}$-inch to $\frac{1}{4}$-inch thick, between sections as the floor is laid.

when the boxing is in position its upper edge should be along the line of the floor-level, as it is over this edge that the levelling-beam is worked when finishing off the floor. (See Fig. II.) To prevent injury to the concrete when removing the boxing, observe the following points:—

1. Paint the boxing on the inside with discarded crank-case oil or with a thin mixture of clay and water, or whitewash.
2. Never nail boxing if it is possible to hold it in position with removable pegs or clamps. If nails are used, do not drive them home.

The quantity of material required for laying each section should be determined by measurement. For example, the volume

FIG. III. [Photo. by R. H. Bevin.

Showing floors of bails completed and covered with sacks; remainder of floor being laid; gutter not completed. Note post foundations in position.

of the concrete for each pair of bails is 7 ft. x 7 ft. 9 in. x 3 in., approximately 14 cubic feet. Now, for measuring, 1 kerosene-tinful = 2/3rds cubic foot; so the total gravel required will be 21 kerosene-tinsful. This may be disposed of in three or four mixings, or 7 or 5¼ tins respectively. Strength of mixture should be 1 of cement to 6 of gravel, so 3½ tins of cement will be required. (1 bag cement = 2 kerosene-tinsful.)

When mixing, heap the gravel at one side of the mixing-board, and scatter the cement evenly over it. Then with the square-mouthed shovels two men should turn the mixture towards the other side of the board and back again, so that the cement is mixed in with the gravel. Usually three turn-

ıgs are sufficient for this. On the fourth turning, water should e added slowly to the newly forming heap as the material is eing turned, and again on the next turning. By this time ıe mixture should be thoroughly wet. Give the cement as ıuch water as it will carry, but avoid excess, as streams ·ickling off the board carry away cement. Experience will ɜctify any faults in this connection.

The mixed concrete should now be put into the boxing, 'ell rammed, and then levelled off with a straight beam, as hown in Fig II.

In order to use time to the best advantage, the floors should e laid down alternately. Thus, if there are four pairs of bails, and 3 could be laid down one day, and then 2 and 4 as soon

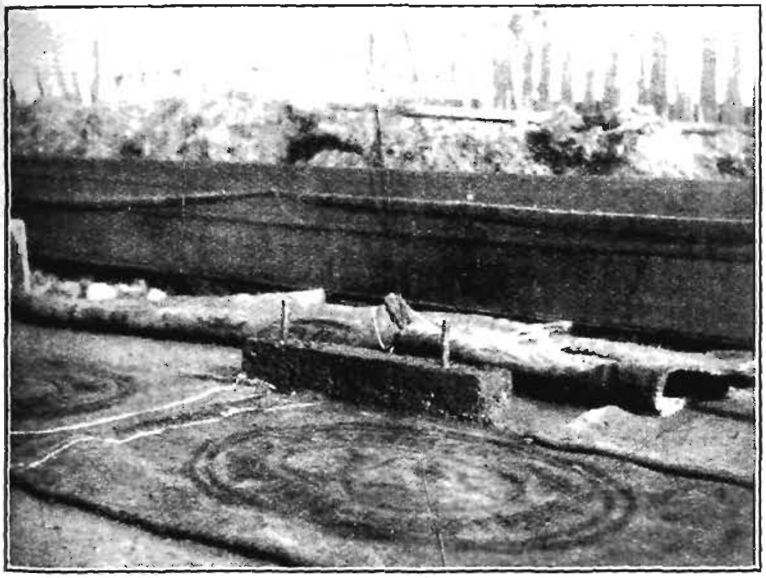


FIG. IV. [*Photo. by R. H. Bevin.*

ɔundations for structure separating two bails, showing bolts in position. The same principle is adopted along the wall-plate foundation.

ɜ the boxing is ready to move. This can often be done about 24 ɔurs after, but it is wise to wait a day longer if the walls ıow a tendency to crumble when the boxing is being taken off.

The drain and the remainder of the floor can be laid in ıe same way as the bails.

Wet bags should be kept on the floor for as long as possible, . order that the concrete may "ripen." The immediate use : new floors is a frequent cause of cracking.

Once the floor is down the wall-plate foundation can be ·oceeded with, and if small foundations are being put down ·r the posts to rest on, the boxing of these should be placed . position before the floor is quite set.

The boxing for the wall-plate foundation should be not less than the width of the plate. Eight-inch bolts should be let into the concrete every 9 feet or so, and by means of these the wall-plate is secured to the foundation.

Small foundations for posts, &c., should be mixed at the rate of 1 to 4 or 5, and should carry an iron spike to fit into the end of the post to prevent its displacement. These foundations may be reinforced by four rods of No. 8 wire, set into the floor at each corner, as shown in Fig. V.

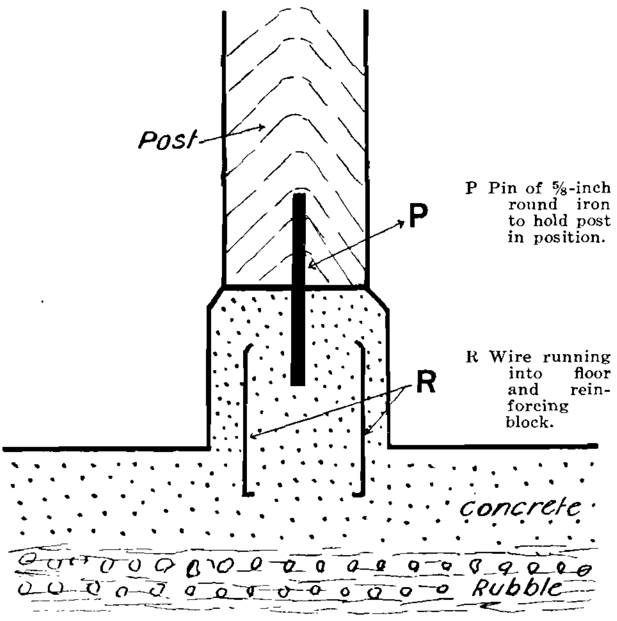


FIG. V.

Sectional View of Post Foundation.

Finishing Off.

It is not wise to have the floor of a cowshed too smooth, and if the levelling beam shown in Fig. II. has been well used the floor needs no further attention, but will be sufficiently rough to prevent animals slipping. The sides and bottom of the drain should be smoothed off with the wooden float, which should be kept well wetted so as to avoid "picking up." Where finer work is required the trowel may be used.

The drain should be at least 12 inches wide, and the sides should be sloped in order to avoid sharp edges. For this part of the work the mixture should be strengthened to 1 : 5.

It may be noted that the measurements given in this article are taken from the plans of a standard milking-shed. These are being prepared by the Department, and in the near future will be available to farmers making application for them.

FURTHER EXPERIMENTS WITH THE CALCIUM CARBIDE-BLUESTONE SPRAY FOR BLACK SPOT.

By H. A. TURNER, Horticulturist, and W. J. DOWSON, Plant Pathologist.

THE experimental work with this new fungicide for orchards, first started in the summer of 1928, and extended in the spring of 1929, as recorded in this journal ("Tasmanian Journal of Agriculture, Vol. 1, No. 3, 1st May, 1930, pp. 101-102), was continued and further extended in the spring of 1930. Two areas were selected for the work, one on the East the other on the West Tamar; the former comprising an area of some 45 acres of pears and apples, and the latter, much smaller, consisting of 74 trees of Jonathans.

At the green tip (delayed dormant) stage of the apples, every tree was sprayed with the calcium carbide-bluestone mixture at the rate of 8 lb. copper sulphate, 3 lb. calcium carbide, in 80 gallons.

At the two subsequent sprayings various modifications were introduced, in order to get over the russeting and cracking effect noticed the previous year on such varieties as Dunn's, Jonathans, and Cox's. As, however, all efforts were without success, it is not necessary to give full details of these trials, the net result being, so far as the apples are concerned, that the spray had the same effects as Bordeaux: was a good fungicide, but open to the objection that the tender varieties suffered from russeting and cracking.

Nearly all the apples in this orchard became somewhat spotted no matter what treatment they had received in the way of sprays. In this instance no distinction could be made between those sprayed with lime-sulphur and those with "carbide."

As a first spray for the green tip stage, carbide is considered to be just as good as any other as a protective fungicide for black spot, in addition to which it is very easily prepared, adheres well, and is likely to be cheaper than any other spray of its kind.

With pears the results have been very encouraging, the main conclusion being that this combination of carbide and bluestone can be applied at any time for black spot of pear, provided that the strength is reduced after the pink stage. The varieties sprayed were Beurre Bosc, Winter Cole, and Williams, at the "delayed dormant" and "pink" stages.

On the West Tamar, at Glengarry, 74 Jonathans were sprayed twice only with carbide; first at the green tip stage, on the 19th September, 1930, with full strength carbide (8 lb. bluestone, 3 lb. calcium carbide, to 80 gallons), and again on the 7th October, at "close cluster" (pre-pink) stage, with half strength carbide (4 lb. bluestone, 1½ lb. calcium carbide, to 80 gallons). There was, however, a certain amount of russeting

on these Jonathans, but we cannot do better than quote the owner:—

> "I should estimate quite 90 per cent. clean fruit, and believe it will be a very good green tip spray, but not at the pink stage. . . . I would like to give it a further trial this coming season on other varieties, as I believe it will prove a very good spray, and be easy to mix."

Those desiring to try the carbide spray should proceed as follows:—

1. Get ready a stock solution of copper sulphate (bluestone) of known strength.
2. Procure small-ground (2 mm.) calcium carbide from the Australian Commonwealth Carbide Company Limited, Electrona, who supply it in sealed drums of 1 or 2 cwt.
3. Fill the vat of the spraying-machine with the bluestone solution and water, so that 80 gallons in the vat will contain 8 lb. of bluestone.
4. Finally, into the vat of bluestone *slowly* drop the carbide. The gassing will cease in about one minute, and the "mixture" is then ready. NOTE.—The whole of the carbide must not be added at once, otherwise the evolution of gas (steam and acetylene) will be too violent and may strain the vat; moreover, acetylene is inflammable, so that no smoking should be permitted while the carbide is being added. No stirring is necessary. The resulting fluid is almost black in colour, and contains solid matter in a fine state of division.

For the calyx and later stages on pears half the quantity of bluestone and carbide should be used.

OVERSTOCKING COWS.

A practice that, unfortunately, is all too common in sale-yards and show rings is that of overstocking.

It consists of allowing a cow to go unmilked for a long time after her usual milking time, in order to make her appear a heavy milker.

This practice will not deceive anyone with experience of dairy cows, and it cannot be too strongly condemned. It is cruel and painful, and prosecutions should follow wilful over-stocking. Permanent injury is likely to be done to the cow, as continual pressure may induce an attack of mammitis, or permanently damage the tissue of the udder.

—*Veterinary Division.*

POTATO MANURIAL TRIALS: SEASON 1930-31.

A Preliminary Report.

By R. A. SCOTT, H.D.A., Agronomist.

THE adverse seasonal conditions have delayed the digging and weighing on several experimental areas, and the complete returns are not available in time for this issue of the Journal.

However, the recommendations based upon all the results available during the past five seasons are here given so that they may be used by farmers during next season's planting. At the same time, it seems advisable to emphasise some other important phases of potato-culture to which attention should be given in order to get increased yields.

The first necessity is *good seed.* Manuring cannot make up the deficiency in yield caused by inferior seed. In the trials at Mount Seymour the yield of almost 5 tons "marketable" tubers from the "no manure" plots bears testimony to the value of good seed.

Next, a suitable potato soil should be selected, and its *fertility* increased by incorporating in the crop rotation the laying down of the land to clovers and mixed pastures, by the use of stock in feeding off crops, and by ploughing in turf and green crop residues. The economic building up of fertility is a slow process, and no chances should be missed to secure the desired end. A measure of soil fertility is the amount of organic matter or humus present, for this substance not only supplies valuable plant food, but it absorbs moisture, which it can hold for use by the plant during spells of dry weather. By building up the soil the farmer is reallly adding the equivalent of some nitrogenous manure, and at the same time providing moisture at critical periods, thereby avoiding growth checks, with consequent tuber malformations and reductions in yields of marketable potatoes.

The *cultivation* is also a controllable operation which generally receives less attention than it deserves. It not only renders plant foods available, but it conserves moisture during dry spells and keeps down weeds. The presence of weeds means reduced yield, because weeds compete with the potato plants for the moisture and plant foods available and harbour diseases and pests of the potato crop. Clean land means a better crop and easier digging.

With soil, climatic conditions, and the above factors varying from farm to farm, there is obviously need for local experimentation to test treatments and methods.

It is suggested that in the course of the ordinary operations on the farm the farmer should incorporate a certain amount of testing. Once the ideas and questions needing answers have been thought out, the Department of Agriculture can be of

assistance in designing trials which will give statistically valid results.

Manuring, cultivation, dipping, dusting, storage of seed, size of sets, spacing of rows and sets in the row, depth of planting, top-dressing, &c., are matters in which there is much need for definite data applicable to local conditions. Such trials should be made in the course of the ordinary routine of potato-growing, and could be so designed that the little time spent on them would return a big dividend in knowledge obtained.

Recommendations.

1. In the Mount Seymour trials manure plots give increases of at least 2½ tons per acre over "no manure" plots. Hence *manuring pays*.
2. *Superphosphate* at Mount Seymour gave over 3½ tons of potatoes per acre more than plots without superphosphate. Increasing the amount of superphosphate beyond 4 cwt. did not produce significant increases.
3. Although for the past three seasons *sulphate of ammonia* with addition of superphosphate has produced very payable increases, this season, owing possibly to exceptional climatic conditions, it has not given any large increases. In consideration of the profitable increases during past seasons it is considered advisable to continue the use of sulphate of ammonia.

   Sulphate of ammonia is known to delay maturity of the crop, and for this reason when manuring early potatoes it would be better to use superphosphate alone. This might not give the same yield, but would give the early ripening which is desirable.
4. *Potash*, this season, has given variable results. At Mount Seymour, on the sandy loam used, potash has given increase of approximately half a ton of potatoes for each hundredweight applied. This is the first definite response by potash in trials conducted by the Agronomy Division during the last four seasons. In the Barrington trial on the basaltic soils potash gave decreased yields. It is intended to continue the testing of potash, especially on the soils of the midlands, where the work has been in progress for only two years.

The present recommendation for the manuring of the potato crop is a mixture of superphosphate 4 cwt., sulphate of ammonia 1 cwt., applied at the rate of 5 cwt. per acre in the furrow at planting time.

USE GOOD SEED.

BUILD UP SOIL FERTILITY.

CULTIVATE THOROUGHLY.

SEED-TESTING.

Notes on the Quality of Samples Examined.

By A. H. WOODFORDE, Senior Seed Analyst.

'HE following notes and tables, compiled from the records of the Official Seed-testing Station for the six months ended 31st May, 1931, will be of interest to all farmers and seed merchants. The figures, with the possible exception of those quoted for Crimson Clover, may be regarded as representative, being based on a review of samples drawn from practically the whole of the seed, in the State, of the species embraced by the Seeds Act, 1930.

It has not been attempted to indicate averages for species other than those which are subject to the Act, as it is considered that, as only a few merchants have submitted such samples, the averages based on them would not be representative. It is gratifying to note, however, that an increasing number of merchants and farmers are submitting miscellaneous samples for test for their own information, and it is hoped that this practice will eventually become general.

For the six months 603 samples were received for testing, representing an increase of 290 on the number submitted for the previous corresponding period. The number of seed merchants submitting samples was 26.

An examination of the returns shows that 79 per cent. of the seed under review was imported, many different seed-producing countries having contributed to the supply.

Generally, the quality of the imported seed was of a satisfactory standard, there being a gratifying freedom from large quantities of the more harmful weeds, such as Dodder, Californian Thistle, Ragwort, &c. The germination was rather low in some instances, although this is not indicated by the averages, which were generally satisfactory. A few samples gave very low tests, nearly all species showing a proportion of percentages below 60. (See Table 2.)

TASMANIAN SEED.

Some fair samples of locally grown Cocksfoot and Ryegrass were received, but unfortunately the quality was not generally up to that of imported seed. The worst defects noted in local samples were insufficient cleaning, and, generally, a tendency to immaturity. These defects were particularly in evidence with regard to Cocksfoot, some samples showing a purity as low as from 60 to 70 per cent., with an average weed seed content of 2·1 per cent. The poorest sample examined contained 7

per cent. of weed seeds and 30 per cent of chaff (empty glumes), while the germination was 32 per cent. The amount of useful seed contained in this sample was only 20 per cent. Though this was an exceptional case, some other samples were of low quality, and farmers would do well, when purchasing grass and clover seed direct from producers, to see that it is accompanied by the necessary statement, also that the significance of the information stated is correctly interpreted. The important thing to remember in this regard is that the germination percentage shown in the statement applies only to the amount of pure seed contained in the parcel, and not to the whole bulk. For instance, if a statement issued with a line of Cocksfoot seed showed "Purity, 60 per cent.; germination, 80 per cent.," the actual amount of germinating Cocksfoot would be $\frac{60 \times 80}{100}$ = 48 per cent., and not 80 per cent., as one might be led to suppose by a hasty perusal of the statement.

Tasmanian Crimson Clover.

Some good samples of the above were received, notably those submitted by the North-East Clovergrowers' Association. These samples were in all cases well up to the standard of imported Crimson Clover, and the Association is to be congratulated on its efforts to produce and sell only first-class seed.

Table 1 shows the average percentages of pure seed and impurities, and the average germination of all the samples examined.

TABLE 1.—*Average Percentages of Pure Seed, Germination, &c.*

Species.	Purity.				Percentage of Germination of Pure Seed.	Max.	Min.	Hard Seed.
	Pure Seed.	Other Crop Seed.	Weed Seed.	Inert Matter.				
Perennial Ryegrass	96·7	·9	1·0	1·4	84	99	35	..
Italian Ryegrass	97·3	·2	1·1	1·4	84	98	7	..
Western wolths Ryegrass.. ..	98·6	·1	·7	·6	86	99	64	..
Wimmera Ryegrass	96·2	·1	1·1	2·6	67	87	38	..
Cocksfoot	81·8	*3·1	1·0	14·1	74	95	22	..
Red Clover.. ..	98·5	·1	·5	·9	84	96	51	7
White Clover ..	95·2	2·7	1·4	·7	77	97	10	9
Subterranean Clover	96·9	·05	·05	3·0	78	94	50	17
Crimson Clover ..	98·9	·3	·3	·5	87	100	57	2
Swede	99·4	..	..	·6	77	98	39	..

* Principally fog and ryegrass.

Table 2 shows the percentage of samples which germinated n the groups indicated in the headings.

TABLE 2.

Species.	Percentage of Samples Germinating in Groups.				Average Germination.
	Under 60 %.	60-69 %.	70-79 %.	80-100 %.	
Perennial Ryegrass	7	4	29	60	84
Italian Ryegrass ..	6	4	23	67	84
Westernwolths Ryegrass	..	3	20	77	86
Wimmera Ryegrass	38	12	19	31	67
Cocksfoot	10	14	38	38	74
Red Clover	6	10	14	70	84
White Clover	9	11	30	50	77
Subterranean Clover	9	12	18	61	78
Swede	18	11	14	57	77

Table 3 shows the percentage of samples of each of the ›pecies shown in the headings which contained the impurities nentioned in the first column, and may be used as an approximate ƣuide to the main impurities which may be expected to occur n the different species.

TABLE 3.—*Showing Frequency of Occurrence of Impurities.*

	Perennial Rye.	Italian Rye	Western-wolths.	Wimmera Rye.	Cocks-foot.	Red Clover.	White Clover.
Sorrel..	26	36	16	31	16	20	86
Docks..	4	6	3	..	10	36	7
Catsear	23	28	3	44	38	..	..
Ribgrass	12	8	3	..	18	87	63
Hawkweed.. ..	14	26	6	32	..	..	..
Hawkbit	4	14	3	25	..	..	..
Scarlet Pimpernel	..	8	..	..	..	4	21
Fat Hen	3	2	3	..	2	3	40
Common Chickweed	..	2	..	..	..	..	19
Mouse-ear Chickweed	4	4	..	..	..	..	14
Catchfly	1	16	3	20	..	..	10
Hairgrass	67	70	53	62	16	..	..
Spurrey	4	10	..	..	..	..	12
Self Heal	..	2	..	..	..	14	19
Sow Thistle ..	..	10	..	..	12	..	..
Soft Brome ..	55	50	46	55	40	..	..
Field Madder ..	3	8	13	..	..	4	10
Suckling Clover..	20	36	26	46	..	..	77
Fog	28	44	20	46	56	..	15
Cluster Clover ..	1	4	3	..	..	..	5
English Trefoil..	..	..	..	..	..	12	37
Dodder	..	..	..	..	..	4	5

RYEGRASS.

As indicated in Table 3, the impurities found in the different Ryegrass species were all of a non-noxious character, the largest quantities occurring in Tasmanian samples. The germination of Wimmera Ryegrass (*Lolium subulatum*) was in most cases considerably lower than that of the other Ryegrass species, the average being 67 per cent. Most samples of Perennial contained a proportion of Italian, but an exact statement of the occurrence of this impurity has not been possible owing to the difficulty of distinguishing the two species apart in the absence from seeds of Italian of the awn or "tail," which is frequently broken off in machine dressing.

COCKSFOOT.

The germination average shown for this species is somewhat low, only 38 per cent. of the samples showing better than 80 per cent. The purity figures are about normal, fairly large percentages of inert matter being of frequent occurrence in Cocksfoot. This is principally due to the presence of "chaff" (empty glumes), the whole of which cannot be removed during cleaning operations without undue loss of good seed. The somewhat high average percentage of weed seeds shown in Table 1 was due to the inclusion of locally grown samples, some of which were, as previously mentioned, very dirty.

WHITE CLOVER.

The average amount of impurities found in this seed was 4·8 per cent. Twelve samples contained weed seeds at the rate of over 10,000 per pound, the principal species being Sorrel, Ribgrass, Fat Hen, Chickweed, and Scarlet Pimpernel. A noticeable feature was the prevalence of Suckling Clover (*Trifolium dubium*), which occurred in 77 per cent. of the samples. In some cases the quantity was unduly high, several samples containing over 15 per cent. Though Suckling Clover is not exactly a weed, and has some value as a fodder plant, it is much inferior to White Clover, and farmers are advised to beware of paying for seed containing large amounts of Suckling at the same rate as that showing a fair average percentage of purity. Only three samples contained Dodder, the noxious weed *par excellence* of Clover seed, one sample being infested to the extent of 1800 seeds per pound.

SUBTERRANEAN CLOVER.

The majority of samples of this clover were of exceptional purity, earth and broken seeds accounting for the greater part of the existing impurity. The remarkable freedom from weed seeds may be attributed to the fact that exporters were at special pains to remove as much as possible of the material capable of carrying eggs of the Clover Springtail or Lucerne Flea, and in consequence the seed was probably subjected to

a more thorough cleaning process than would otherwise have been the case. The germination average may be regarded as satisfactory, and although it may appear somewhat low, it will be seen from Table 1 that this was due to the occurrence of hard seeds, of which fairly high percentages are common in Subterranean Clover. A moderate degree of hard seededness is not a serious disadvantage in the case of a permanent clover, as the majority of such seeds may be counted upon to germinate after a lapse of time.

RED CLOVER (COWGRASS).

The averages for Red Clover were also satisfactory, the predominating impurity being Ribgrass (*Plantago lanceolata*). Several samples, obviously tailings from the dressing of Red Clover, contained nearly as much Ribgrass as Red Clover. Seed of this quality is being sold as a mixture, and, whilst possibly of sufficiently good quality for sowing on a bush burn or on inferior country where the aim is to cheaply improve the carrying capacity, is not suitable for use on land capable of producing good pasture or high yielding fodder crops. Ribgrass may be considered harmless as a weed where it occurs in small quantity; but it has little value as a fodder plant, and, as in the case of White Clover containing Suckling, farmers are cautioned against paying the same prices for Cowgrass-Ribgrass mixtures as for Cowgrass of high purity.

ANSWERS TO ENQUIRIES.

Question.—Can you tell me the treatment for warts on teats of cows?

Answer.—Apply olive oil and vinegar alternately after each milking. If capable of being removed by ligature, apply silk ligature. Paint daily with glacial acetic acid or touch with moistened stick of silver nitrate.

—*Veterinary Division.*

Question.—Last season I raised by own tomato plants. The seed germinated well, and so long as the plants remained in the frame they appeared vigorous and healthy. Soon after planting out in September most of them became very sickly, many turned purple, and the leaves were marked with light-grey blotches or spots. The plants made little growth, and never really recovered. What was the disease, and how can I avoid it in future?

Answer.—Your plants were not diseased in the sense that some parasite—fungus or insect—was at work, but the description is that of a severe check to growth, which always results when young plants are removed from the warm congenial conditions of the frame and planted out too early, when the soil temperature is still very low. This is a very common mistake in tomato-growing, and probably has its origin in the desire to be the first on the market with early fruit. Remember that the tomato is a sub-tropical plant, and will not thrive under anything but warm conditions. The remedy for your trouble is to plant out three weeks to a month later, according to the weather.

—*Plant Pathologist.*

TOBACCO CULTURE.

Selection of Planting Area and Preparation of the Soil.

By R. B. STEELE, B.Sc. (Agric.), B.Sc. (Forestry), District Agricultural Organiser.

FARMERS who intend to grow tobacco next season, either on a small scale for experimental purposes or as a trial crop on a commercial scale, should select the area which they intend to plant as soon as possible, and commence the preparation of the soil. When selecting the area the following factors must be considered if the type of leaf required by the trade is to be produced:—

(1) *Type of Leaf Desired.*—If tobacco-growing in Tasmania is to prove a commercial success, growers must aim at producing the grades of tobacco for which there is a good demand at profitable prices. The demand at present is for light-yellow, orange, or bright mahogany tobacco, which possesses good aroma and smoking qualities. Tobacco complying with these requirements can be grown only on suitable soils and in localities where the climate during the summer and autumn is favourable to the development of leaf of good aroma and quality, which will ripen properly before cold weather sets in.

(2) *Climate.*—Though a grower cannot alter the weather conditions experienced in his district, he can do a lot towards modifying unfavourable conditions by selecting on his farm the area most suitable for tobacco. The plant requires sunshine and warmth, especially in the autumn; sufficient moisture in the soil throughout the summer to encourage leaf-development; protection from strong winds; and freedom from severe autumn frosts.

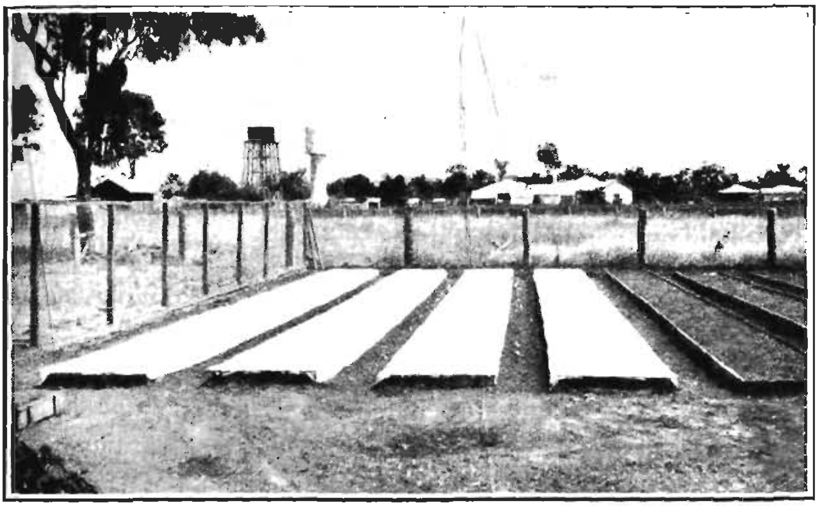
The area selected should therefore be one which receives the maximum amount of sunshine, and should not be shaded by trees or hills between 8 a.m. and 4 p.m. It should, if possible, have a northerly aspect and a warm, well-drained, and well-aerated soil. Last season many of the trial plots of tobacco grown by farmers were situated on cold southerly slopes, in shady valleys, or else on land too shaded by trees. Hence the leaf did not ripen, and so could not be cured satisfactorily.

The area should not be too exposed to wind, otherwise the leaves are liable to be broken and bruised. It is possible to prevent a good deal of the damage due to wind by providing temporary wind-breaks. Rows of maize or broad beans sown at intervals between the rows of plants at right angles to the harmful winds will often prevent damage to the leaves.

Though the tobacco plant will stand fairly heavy frosts when the leaves are green, leaves which are almost ripe enough for harvesting are liable to be ruined by a severe autumn frost, especially if the sun's rays fall on the leaves while they are still covered with frost. Hence it would be unwise to plant

tobacco on an area where autumn frosts are liable to occur before the leaf is harvested. In localities where all other factors are favourable to the production of good-quality leaf it will probably pay to make provision for protecting the ripening crop by artificial means.

(3) *Soil.*—The selection of an area with the right type of soil is of the greatest importance. The physical and chemical properties of the leaf are determined by the soil on which it is grown. As a general rule, light tobaccos, which are in such demand, can be grown only on light, sandy soils. Sandy and medium loams will also produce tobacco of good quality of the bright mahogany type, while clayey soils, or soils which consist of very fine particles that run together, yield a heavy grade of tobacco usually of poor quality.



Seed beds showing calico coverings.

The area selected should therefore have a light, sandy soil containing a fair percentage of silt, with a porous subsoil in which there is sufficient clay to give it the power to retain moisture. If such a soil is not available, then a sandy to medium loam should be the second choice. The smaller the proportion of clay, the better the quality of the leaf. Clayey soils and rich land containing too high a percentage of nitrogen must be avoided. Soil which is too rich tends to produce a coarse leaf, with large midribs and veins, unsuitable for the production of bright tobacco.

Humus or organic matter should be present in order to improve the aeration and the moisture-holding capacity of the soil. Any deficiency of organic matter can be best supplied by green manuring. The application of farmyard manure would probably increase the nitrogen content too much, and therefore be harmful.

Good drainage is essential on all types of soil. A soil which becomes excessively wet during the growing season will produce coarse tobacco which cannot be cured to a yellow colour. It also injures quality and delays ripening. Tobacco of good quality can be grown only on soils which are sweet and well aerated. Hence badly drained soils and those which become packed after heavy rain should be avoided.

The presence of salt in the soil is also detrimental, as it affects the burning quality of the leaf. Tests of many of the samples of leaf grown last season within a few miles of the sea show definitely that their burning quality has been detrimentally affected by the common salt in the soil. Intending growers near the coast must therefore avoid soil containing salt if they are to produce marketable leaf.

PREPARATION OF THE SOIL.

The area selected should be ploughed as soon as possible and worked frequently until planting time, in order to eradicate weeds and, in districts with a low summer rainfall, to conserve moisture. The roots of the tobacco plant penetrate to a fair depth, so if the soil below plough depth is compacted it would be advantageous to loosen it by subsoiling without bringing the subsoil to the surface. Subsoiling will encourage deeper rooting, thereby helping plants to keep growing during a dry spell.

Tobacco requires a sweet soil, containing a fair percentage of lime and potash. Hence the application of lime after ploughing will probably prove beneficial. On light soils sulphate of potash, at the rate of 1½ to 2 cwt. per acre, should be applied about the same time, as it takes about six months to change to the form which can be taken up by the plant. Muriate of potash should not be used, as the chlorine which it contains will have a detrimental effect on the burning qualities of the leaf produced.

Tobacco also requires a fair amount of phosphoric acid, and as most Tasmanian soils are deficient in this constituent, it will be necessary to apply a phosphatic fertiliser. Phosphates improve the quality of the leaf and hasten maturity, the latter being most important in Tasmania owing to our comparatively short season. Superphosphate is probably the best phosphatic fertiliser to use, and it should be applied at the rate of 4 to 6 cwt. per acre, half of which should be broadcast before planting and the rest applied at planting time. The best method is to plough out a furrow where the rows of plants are to be set out, scatter the superphosphate in this furrow, and then turn in a furrow from either side, burying the superphosphate just beneath where the plants are to grow. The ridges made should be smoothed down a little by harrowing in the same direction as they run. Tobacco is generally planted in rows 3 feet, 3½ feet, or 4 feet apart.

On the mainland it has been proved that this method is better than broadcasting the whole of the fertiliser beforehand, as it stimulates rapid early growth before dry weather

.s in. Rapid development of the leaf improves its texture, d also gives it a longer period of warm weather in which to ›en.

Raising Tobacco Seedlings.

Intending growers must make arrangements to raise from ·d the plants required for the area which they propose to ınt. In August the Department of Agriculture expects to have d of the varieties considered suitable for Tasmanian conditions ailable at cost price to approved growers who have land suit- le for tobacco-growing. This seed will be disinfected and tested · germination before distribution. The cost of sufficient seed .. raise the number of plants required for one acre—about 6000 on an average soil—will probably be about 1s.

Last season's trials definitely proved that the planting in the field must be completed before the end of November if the leaf is to mature and ripen before cold weather sets in. In districts with a low summer rainfall, planting in late October or early November will probably give the best results.

This means, therefore, that the seed must be sown in specially prepared and covered beds in August and early September if the young plants are to be large enough for transplanting in October or November. As the weather is generally cold in early spring, the seed-beds will probably need to be heated in some way. The site of the beds should be a warm, sunny one, with a north-easterly or northerly aspect. The young plants need the full sun all day for quick and healthy growth.

Heating the Seed-Beds.

The beds may be heated either by a hotwater system with pipes running beneath the bed, or else by the use of stable manure. If the latter method is used, a suitable bed can be made by digging a trench 4 feet wide and a foot deep and as long as desired. This trench is then filled with good fresh stable manure containing plenty of straw. Provision must be made for drainage in order to prevent the manure in the trench becoming waterlogged. Then a wooden border a foot high is built round the bed, which is covered with light, sandy soil to a depth of 6 inches. If possible, this soil should be baked or heated in some way before being put on, in order to kill any weed seeds, insects, and fungus spores present. The preparation of the bed should be completed a week or two before sowing is commenced, in order to allow it to heat up and consolidate. The weed seeds near the surface will also germinate.

A complete fertiliser, at the rate of 1 lb. per square yard, should be well mixed with the soil either before or just after it is put on the bed.

Sowing the Seed.

Tobacco seed is very fine, there being between 300,000 and 400,000 in an ounce. This quantity of seed will yield about 30,000 good plants, or sufficient to plant 5 acres of land. A bed with an area of 50 square yards is required for each ounce

of seed sown. A heaped teaspoonful of seed is sufficient to sow a bed with an area of 60 to 70 square feet, and will provide plenty of plants for 1 acre, if the bed is properly constructed and cared for.

The seed is so fine that before sowing it should be mixed with dry sifted sand or ashes—about 2 quarts for a teaspoonful of seed. This is then spread evenly over the finely prepared surface of the bed, and brushed or watered in. The seed must not be covered deeply or it will not germinate. The bed must be kept covered wtih cheesecloth, calico, or glass, both day and night, until the seedlings have developed four leaves. The surface of the bed must be kept damp, but not too wet. If it is allowed to dry out even for a short period, the delicate seedlings will be killed. The seed will take from two to six weeks to germinate, varying according to the weather conditions, and the heat of the bed. About three weeks is an average time.

PRE-GERMINATION.

In order to hasten germination it will probably pay to pre-germinate the seed before sowing. The method is as follows:—Roll up the seed which is to be sown in a piece of flannel, place in a glass of hot water, and allow to soak overnight. Then squeeze the water out of the seed and flannel, spread the seed evenly over a piece of damp flannel on a large plate, and cover with another piece of the same material. Blotting-paper may be used instead of flannel. Keep the flannel damp, but not too wet, and place the plate in a warm place. If conditions are right, the seed will commence to germinate inside a week. When most of the seed is showing signs of shooting, mix it with fine sand or ashes, and spread evenly over the previously prepared bed, cover with a thin layer of sand, or just water it in. The seed will come away almost at once.

The advantages of this method are that it hastens germination and enables one to raise earlier plants; it is possible to ascertain whether the seed is good before sowing; it prevents the loss of seed from unfavourable conditions if it lies in the ground for several weeks before the conditions are right for germination.

CARE OF THE PLANTS.

When the plants have developed four leaves the covers over the beds should be removed on favourable days and replaced each night. Ventilation must be provided to prevent damping-off. Weeds should be kept down, and the plants should be thinned until each plant left has about 1 square inch of space. To stimulate growth the plants should be watered every fortnight with liquid manure, made from 2 oz. of nitrate of soda in 50 gallons of water.

In eight to ten weeks they should be ready for planting out, and should be gradually hardened off by removing the coverings every day and on suitable nights.

THE SPRAYING PROGRAMME.

(By the Staff of the Horticultural Division.)

DURING the past season four spraying experiments were carried out in different parts of the State. The primary object of these was to ascertain if possible the effects produced by the various spray materials on the development and control of " leaf-spot." As the season progressed, however, it became evident that much useful information in the control of other insect and fungus pests might also be obtained, and subsequently a careful check was maintained on the development of black spot (*Venturia inæqualis*), apple mildew (*Podosphaera lencotricha*), red spider (*Bryobia pratensis* and *Tetranychus telarius*), and other pests, details of which will be discussed in turn.

The scheme of spraying adopted in most cases was as follows:—

Section 1—

Bordeaux, 6-4-40, " green tip."
Lime-sulphur, 1-20 to 30, " pink."
Later lime-sulphur, 1-60.
Arsenate sprays eliminated.

ction 2—

Bordeaux, 6-4-40, " green tip."
Arsenate of lead, " calyx."
Sulphur sprays eliminated.
This was varied in the northern trials, a Bordeaux 4-4-40 at the " pink," and a 2-2-40 later, being applied.

Section 3—

Lime-sulphur, 1-20-30, " pink."
Arsenate of lead, " calyx."
Copper-sulphate sprays eliminated.

Section 4—

Control plot.
No sprays.
All sprays eliminated.

From the above scheme it will be seen that, in turn, certain essential sprays have been omitted from the usual spring and summer spray programme. This will at once throw light on the advisability or otherwise of such omissions in a season such as that which has just been experienced.

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Black Spot Control.

The development of black spot on the leaves and fruit can easily be followed, and exact counts were made in regard to this on one or two of the plots. The figures appear in Table 1.

Table 1.

Treatment.	Plot.	Total Apples.	Total Spot.	Percentage of Spot.
Arsenate Eliminated (Section 1)	I. Bagdad A	707	95	13·4
	II Bagdad B	1334	275	20·6
	III Tamar	..	..	..
	IV. Huon	..	23	13·0*
Sulphur Eliminated (Section 2)	I. Bagdad A	441	161	36·5
	II. Bagdad B	1840	746	40·5
	III Tamar	..	..	1·0†
	IV. Huon	..	143	30·0*
Copper-Sulphate Eliminated (Section 3)	I. Bagdad A	388	68	17·5
	II. Bagdad B	1380	166	12·0
	III. Tamar	..	..	20·0
	IV. Huon	..	45	28·0*
Control. No Sprays (Section 4)	I. Bagdad A	265	195	73·6
	II, Bagdad B	413	331	80·1
	III. Tamar	..	..	90·0
	IV. Huon	..	108	61·0*

* Owing to difficulties in harvesting only approximate figures could be obtained.
† In this plot three Bordeaux sprays were given.

Although some considerable variation exists between the plots, yet it is evident that the same trend runs through them all, and, generally speaking, the order of control might be placed as follows:—

(1) Best general control, Section 1, where both Bordeaux and lime-sulphur were used—about 15 per cent. spotted fruit.

(2) Section 3, where a "pink" stage lime-sulphur was applied, but no "green tip" Bordeaux—about 20 per cent. spotted fruit.

(3) Section 2, where a "green tip" Bordeaux was applied, but no "pink stage" lime-sulphur—about 35 per cent. spotted fruit.

(4) Section 4, where *no* spray was applied; the infestation was exceptionally severe, running to 90 per cent. in some cases.

With reference to the above order of control, it should be mentioned that, whilst the figures referring to Section 2 seem to indicate a lack of effectiveness of the "green tip" Bordeaux when compared with Section 3, where a "pink" lime-sulphur

was applied, it must be remembered that in the latter several later sulphur sprays were applied. Where a similar number of Bordeaux sprays was applied, as at the Tamar plot, spot infection was reduced to a minimum. The later Bordeaux sprays, however, caused excessive russeting of fruit, and cannot be recommended in preference to lime-sulphur at this stage.

From the results appearing in Table 1, the importance of the "pink" spray is clearly seen, and a comparison of the "green tip" Bordeaux (Section 2) with the control (Section 4) also serves to demonstrate the importance of the "green tip" spray.

Many experiments have been carried out in an endeavour to compare the relative fungicidal properties of lime-sulphur and Bordeaux, and, whilst the latter spray has in most instances given a slightly better control of black spot, the scorching and russeting effect of the copper sulphate on leaves and fruit has proved a decided drawback to the later applications. In addition, with the necessity for an early combined insecticide and fungicide, lime-sulphur is coming more into prominence as the desirable spray for this period.

RED SPIDER CONTROL.

Red spider was prevalent on only one or two of the plots treated, and close examination revealed considerable differences between the various sections in these plots. In all cases where lime-sulphur had been used at the "pink" and "calyx" stage a very good control of spider during the greater part of the season was obtained. On the "control" section and in Section 2, where sulphur sprays were absent, quite a number of spiders could be found. The advantages, therefore, of the lime-sulphur, both as fungicide and insecticide, at this "pink" spray cannot be overlooked.

MILDEW CONTROL.

In the past season little mildew was found on the plots under treatment, and only in one instance were there sufficient diseased shoots and leaves present to obtain accurate data, this being at Franklin. Counts of diseased shoots were made at this plot towards the end of January, with the results detailed in Table 2.

Table 2.

Treatment.	No. of Shoots.	No. of Diseased Shoots.	Percentage Affected.
Section 1	459	25	5·6
Section 2	310	84	27·0
Section 3	242	13	5·4
Section 4	201	55	27·0

It will be seen from the above table that the outstanding spray for summer control of mildew is sulphur in some form

or other. A comparison of Section 2, where only Bordeaux was used, and Section 4, which was left unsprayed, shows that practically no difference in the percentage of mildews present is noticeable, each having the tips of more than a quarter of their shoots diseased.

The following are briefly the most outstanding observations in regard to a number of spray tests carried out during the past season:—

(1) The necessity for a "green tip" spray for the control of spot. As compared with the unsprayed sections, a single "green tip" Bordeaux reduced the spot infection by about 50 per cent.

(2) The importance of a "pink" spray for the control of spot. As compared with the Bordeaux "green tip" sections, a single "pink" lime-sulphur reduced the spot infection by a further 50 per cent.

(3) The advantages of lime-sulphur used for the "pink" and later sprays as a control for red spider and mildew.

In the coming season it is proposed to carry out further experiments, with a view to increasing the efficiency of lime-sulphur whilst decreasing the danger of its scorching foliage and russeting the fruit.

Thanks are due to Messrs. Lucas and Weedon, E. Diers, H. G. Hay, L. R. E. Griggs, and S. J. Bisdee for placing suitable experimental areas at the disposal of officers of the Fruit Division of the Department of Agriculture and otherwise assisting in the carrying out of the above experiments.

ANSWERS TO ENQUIRIES.

Question.—Some years ago I planted out a number of strawberries. These, and also subsequent plantings, have produced an abundance of flowers, but little fruit. Can you suggest the cause and remedy?

Answer.—If you are growing one variety only, the crop failure is probably due to lack of cross-pollination. Most strawberry varieties are more or less self-sterile, and should be grown alongside others.

Should this not be the case, it is quite possible that you have been applying too much fertiliser and watering too heavily, with the result that the plants are growing over-vigorously. —*Horticultural Division.*

Question.—I wish to know how to treat sprained tendon in a horse's leg.

Answer.—Apply cooling lotion three times a day. This may be made by mixing one teaspoonful of lead acetate and one teaspoonful of zinc sulphate in a pint of cold water. Shake bottle before pouring out. Place three or four layers of cotton-wool round the leg, and bandage over this. Do not apply blisters or irritatingliniments, as is commonly done.

—*Veterinary Division.*

POTATO CULTURE.

Its Part in a Rotational System.

By C. E. W. OLDAKER, Agronomist.

HUSBANDRY in its real sense of improving and maintaining soil resources should be the aim of every farmer, and should supersede the mere growing of cash crops, which has unfortunately taken too large a place in our agricultural practice.

On account of the exhausting nature of the potato crop, one of the first and most important considerations in potato-culture is that it should be part of a well-considered rotational scheme, including short-term pastures and the use of stock.

Throughout the main producing districts of Tasmania mixed farming in various degrees is the general practice, and, given comparatively small subdivisions on the holding, it should be a simple matter to establish such a rotation that soil fertility and cash crop yields may not only be maintained but considerably increased.

The following plan, with slight modifications to suit unusual conditions of season or location, has proved to be a valuable method of sustaining production on the red basaltic soils of the North-West Coast:—

1st year	Potatoes.
2nd year	Cereals (hay or grain).
3rd year	Pulse (peas or beans).
4th year	Algerian oats, clovers, and grasses.
5th year	Clovers and grasses.
6th year	Clovers and grasses.

Under such an arrangement there will be an area seeded to pasture each year.

In preparation for the oats and grasses a first "spring-tooth" cultivation or ploughing should be made as soon as stock have picked up scattered peas from the previous crop. Subsequent preparation should be very thorough. Dry working through the early autumn has a very valuable influence in producing good soil-tilth and a fine and compressed seed-bed.

With seasonal conditions about normal, the seeding is best carried out at some time near mid-April. This period is chosen because of the probability of the oats sufficiently advancing to constitute an effective nurse crop for the young clover and grass plants, while at the same time, on account of the advanced season, there is no great danger of too rapid development and a smothering effect.

At seeding, the oats and manure should be first drilled in and the paddock cross-harrowed. The grass mixture may then be sown either by hand or with one of the many convenient machines made for the purpose. The cross-harrowing, in break-

ing down the drill marks, provides a different position for the small seeds, and avoids the crowding with the oats which would otherwise occur. The surface is then finished off with a brush harrow, which may be constructed in a few minutes by affixing some bushy growth to the harrow draw-bar and lashing the branches together at the back in order to prevent any missing of the field surface. The resultant crop may be either grazed at a comparatively early stage or allowed to run through for a hay crop.

Unless the ground is in a boggy condition very little harm occurs to the small plants by the trampling of stock, and in practice it has been found that the best grass stand follows if feeding-off is commenced in a careful manner at a suitable stage, and thus continued throughout. If finally used as hay, the crop will provide valuable fodder for horses and wintering stock. When a really good pasture is desired it is inadvisable to allow the oat cover crop to mature, but it should be fed off completely. Also, a light seeding only should be used—not more than two bushels per acre, with grasses and clovers appropriate to the conditions.

At least one bag of superphosphate or nitro-superphosphate should be applied per acre at the time of sowing, although in practice it is found that heavier dressings are profitable.

The fourth year operations are the most important in a rotation of this kind. The laying down of the land to pasture provides a period of rest, during which the fertility is increased by the accumulation of organic matter or humus of both plant and animal origin. Material on which beneficial bacteria are able to operate and produce plant food is provided. When cultivation is resumed a soil in good tilth, and highly retentive of moisture, is obtained, and goes far towards providing all the requirements of the potato crop, with the exception of some of the minerals, such as phosphates.

Nothing can compensate for the absence of humus, and while other factors, including disease, have contributed towards reducing crop yields, the past history of Tasmanian agriculture amply bears this out. On our best soils, during the early years of settlement, crop returns of 15 to 20 tons of potatoes per acre, without any application of manure, were frequently known. The high proportion of organic matter, accumulated during long periods in the virgin soils, was responsible. Examination of many of these same soils to-day will disclose a harsh, "cloddy" condition, distinctly unfavourable to the development of the delicate fibrous root system of the potato. Such a condition results in an unsuitable tilth and the absence of the plant foods which humus contains.

Some attempt to maintain the organic content has certainly been made of recent years, but the method usually adopted, though helpful, is insufficient. It consists of seeding Algerian oats early in the autumn, and partially eating them off with stock. The crop residue, together with droppings from the animals, is then ploughed in with potatoes during the follow-

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ing spring. A complete system of green-manuring, including legumes, is practically unknown.

Taking a broad view of the position, by far the most satisfactory plan, especially for those who actually own the land upon which they are working, is to carefully consider and organise a working plan for several years ahead. An approved system having as one of its primary objects the "resting" of the land, or, in other words, raising the fertility level through the employment of short-term pastures and stock, has everything to commend it. The animals will materially assist in the dual purpose of furnishing a monetary return and rebuilding the soil condition in a manner which may be definitely relied upon to improve potato yields. Under a rotation somewhat as set out earlier in this article, on many farms the usual area now devoted to the crop might be considerably reduced and yet result in the production of a greater bulk of tubers.

ANSWERS TO ENQUIRIES.

Question.—Every spring and early summer I notice that my peaches and nectarines have many curled-up leaves, some being much distorted and coloured red. Many of them are also infested by small black and green flies. These troubles seem to disappear later, but the fruits are few and small.—What is the disease or pest, and what treatment should be adopted?

Answer.—Your peaches and nectarines are suffering from two troubles, a fungus disease causing distorted, red, curled leaves, and an insect pest, which also makes the leaves curl. The two are often found together. The first is called peach-leaf curl, due to the parasitic fungus *Taphrina deformans.* The small flies are aphides.

To rid the trees of both, proceed as follows:—Cut out those shoots, especially the tips, which were bad last season; then spray with strong lime-sulphur, 1 to 8. In early spring, when the buds are moving, spray again with lime-sulphur of the same strength. As some buds will be more advanced than others, it will be advisable to spray a third time, about a week later, with 1 to 15 lime-sulphur. The first (winter) spray will kill the eggs of the aphides, and the others will kill the germinating spores of the fungus which are lodged between the bud scales. A summer spraying with black-leaf 40 (nicotine) will prevent reinfection of aphides from neighbouring unsprayed trees.

—*Plant Pathologist.*

Question.—Can sulphate of ammonia and super. be mixed before sowing, without loss of either ingredient?

Answer.—Yes. There may be a very slight loss of nitrogen from the sulphate of ammonia, but you are quite safe in making the mixture.

—*Agronomy Division.*

Question.—Last April I sowed a paddock with a mixture of Italian ryegrass and red clover for spring feed. The clover is coming well, but the grass seems thin and sick—only a few plants here and there—although I put on a good bushel of seed to the acre. The certificate that I got with this seed read "Germination, 70 per cent." Would this be considered fairly good?

Answer.—From your description it seems probable that the vitality of the grass seed was poor. This is also indicated by the germination percentage, which is a good deal below what is considered a fair average (85-90.)

—*Seed-Testing Section.*

Question.—What are the symptoms and treatment of blackleg in calves?

Answer.—Blackleg is an infectious disease almost wholly confined to young cattle, and is carried by a particular bacterium. Symptoms are dullness, high fever, lameness, crackling swellings under the skin. Death generally occurs within 24 hours. On post-mortem examination, certain muscles are black, swollen, and infiltrated with gas.

Treatment is useless. It is compulsory to notify suspicion or existence of the disease. If the disease is diagnosed, protective inoculation of the in-contact calves is carried out by the Government Veterinary Officer. Burn or bury deeply all carcases. Disease is spread by contaminated streams, or by dogs, pigs, or birds having access to undestroyed carcases.

—*Veterinary Division.*

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THE DIE-BACK DISEASE OF APRICOTS.

Preliminary Note.

By W. J. DOWSON, Plant Pathologist.

FOR many years a dying back of apricot branches has been known in Tasmania wherever these fruits are grown in any quantity. Up to within the past four to five years the trouble has been confined to old trees, which are prone to lose a limb or two in the ordinary course of events. When, however, a very similar dying back began to appear in relatively young plantations, with the result that limb after limb was destroyed within a few seasons, it was deemed advisable to investigate the trouble as thoroughly as facilities would allow.

The investigation is by no means complete, but sufficient has been discovered to justify definite recommendations as to control measures, and the present note has been written with the object of informing all interested in the disease exactly how much has been found out. The lines along which the control of the disease is likely to be most successful are also indicated.

The trouble is a definite dying back of both young and old branches, dead and dying portions of which are invaded by the mycelium (spawn) of a fungus. The presence of this fungus causes infected trees to produce gum to such an extent that the sap-conducting channels of the wood become so clogged that the water supply is cut off, with the result that the branches are killed. The first obvious sign that anything is wrong with a tree is the appearance of a pale colour in the foliage of one or more branches, which is followed by wilting of the leaves as the season advances. Such limbs never recover, but quickly die. Should the wilting occur fairly early, the affected branch is killed by the end of the season. On the other hand, if wilting does not take place until late, the branches usually survive the winter, but die early in the following season.

The careful examination of a large number of such branches has shown that infection can be traced in every instance to an old pruning wound, generally a stump where a shoot has not been cut off short enough. Such stumps or snags invariably die, and constitute suitable places for wound invaders to make a start.

After living for some time on such dead portions, these invaders begin to extend their operations by attacking the underlying living tissues, at first very slowly, and may continue to do so unnoticed for some years. The final effect of wilting and dying is, however, always sudden.

In autumn the fruit-bodies of the coral spot fungus—*Nectria cinnabarina*—have been frequently observed on the dead portions of attacked trees, and the same fungus occurs in some quantity on the heaps of prunings which it has been customary to gather up and deposit at the edges of orchards.

In other countries, especially Europe and North America, the coral spot fungus causes similar damage to a number of ornamental trees such as horse chestnut, lime, sycamore, &c., and in Britain a serious, chronic disease of red-currant bushes is produced by the same fungus. Apples are also attacked in Britain. The red-current disease is similar in appearance, and the final results are the same as that now recorded for apricots in Tasmania.

Nectria cinnabarina is usually found growing on dead wood, but on occasion, when conditions are suitable, will invade and kill living tissues. In the former phase this fungus is exceedingly common, and is practically world-wide in distribution. The spores produced on the coral-like spots are of two kinds, and correspond with those of the black spot parasites of apple and pear. They are dispersed in precisely the same way: the first crop being splashed about by rain, and the later, or dormant, crop being shot into the air and transported some distance by the wind.

Insects also are likely to convey the spores from place to place.

Bearing the above facts in mind, control measures should be designed along the following lines:—

1. The removal of sources of infection. All prunings should be taken away and burnt.
2. All wilting and dead shoots, branches, or limbs should be cut out and burnt, care being taken to see that the cuts are made far enough back, beyond any discolouration of the wood.
3. In pruning it is very important to cut off level with the surface of the parent limb or branch, thus avoiding snags, which are certain sources of trouble.
4. Large pruning cuts should be painted over with good white paint soon after being made. A second coat of paint will be required about a month later to cover up cracks which will appear in the first covering.
5. In the younger orchards everything possible should be done to increase and maintain both health and vigour of the trees by sound cultivation and the application of correct manures.

REPORT ON ROTATIONAL GRAZING TRIAL IN ST. MARYS DISTRICT.

By R. H. Bevin, Dip. C.A.C., B.Agr., District Agricultural Organiser.

In 1929 the Department, in co-operation with Mr. G. H. Napier, of St. Marys, commenced a trial, with the object of determining what increase in production could be effected by applying improved methods of pasture management to Mr. Napier's property, which is typical of the dairy farms in the district.

As opportunity offered, a certain amount of subdivision was carried out. The pastures, which were, in general, badly sod-bound and heavily infected with rushes, have been improved by drainage, topdressing, and surface cultivation.

As far as possible, an attempt has been made to establish conditions which would enable intensive pasture management methods to be put into operation, and control of the grazing has received special attention.

The commencement of this trial was reported in the August, 1930, number of the Journal, when a summary of the first year's activity was given. The work has been continued, and the record of the results and conclusions for the last season is now available.

The same area of land was utilised as in the previous year, but in addition, owing to the dry conditions prevailing, a small area apart from the farm was used on occasions. This has been allowed for, and the calculations of carrying capacity have been based on the principle of stock days entered against the various paddocks as they were grazed.

Since the last article was written a distinct change in the nature of the herbage is noticeable: there has been a marked increase in Perennial Ryegrass and White Clover; and the Brown Top, while still being the predominant grass, has changed from its sod-bound, dead appearance, and, owing to the heavy tripod harrowings which have been given, is now producing a more "lively" turf. The rushes, which were a great source of loss of grazing ground, are being steadily wiped out, and it is remarkable to see how clover and grass are covering the thinned-out clumps which were once strong growing rush plants. This result is due to better drainage and to autumn cutting, allied with heavy grazing while the stock are on the various paddocks.

No additional fencing has been erected, with the exception of a few chains which provide a wide lane across the farm from the shed and open on to the majority of the paddocks.

Owing to the rather dry conditions prevailing during certain months, the season 1930-31 was not entirely favourable from a dairying point of view. From September to March the rainfall was 1040 points (average 1432 points), and of this 400 points fell in December, to be followed by an excessively dry January, with only 50 points (average 358 points). This resulted in a low production of feed in early autumn. Despite the unevenness of pasture growth, the production from the farm is distinctly

on the upgrade, and, taken with the improved conditions noticeable on the land, is encouraging and indicative of further possible improvement.

RESULTS.

Year.	Stock Days.	Average No. of Cows.	Days Recorded.
1929-30..	6988	35	200
1930-31..	8411	39	240

The stocking was more evenly distributed over the farm than in the 1929-30 season, indicating the trend towards a higher general level of the quality of the pastures.

The performance of the paddocks recorded in the previous returns is shown below, with the addition of the latest figures:—

Paddock and Area.	Treatment.	Year.	Total Stock Days Recorded.	Stock Days per Acre.	Carrying Capacity of One Acre.
No. 5, 8 ac.	Topdressed, 1 bag super., 1928, 1929, 1930	1929 1930	1178 1414	147 177	35 cows for 4·2 days 39 cows for 4·5 days
No. 8, 8 ac.	Topdressed, 1929, 1930	1929 1930	1283 929·5	160 116	35 cows for 4·6 days 39 cows for 3 days
No. 10, 7½ ac.	*Sown temp.* pasture, 1928; topdressed, 1929, 1930	1929 1930	1000 929	133 116	35 cows for 3·8 days 39 cows for 3 days
No. 3, 11 ac.	Topdressed, 1929, 1930	1929 1930	736 909	67 83	35 cows for 1·9 days 39 cows for 2·1 days
No. 4, 3½ ac.	Topdressed, 1928, 1929, 1930	1929 1930	681 894	194·6 255	35 cows for 5·6 days 39 cows for 6·5 days

From the above paddock returns the following points are of interest:—

No. 5 shows improvement following on topdressing.

No. 8 shows diminution in number of stock days. This paddock has a great deal of Yorkshire Fog (soft grass) in the pasture. Last season it gave an abundance of feed, and was really more heavily stocked than in this season, because of shortage on the Brown Top paddocks. It is interesting to remember, however, that the cows "went back" whenever they were on No. 8 in 1929-30. This year the higher productivity of the remainder of the farm has enabled limited stocking of No. 8 to be maintained.

No. 10: Temporary pasture is on the wane, and will possibly need to be ploughed up next year.

Nos. 3 and 4 still show a considerable disparity in carrying capacity. The effect is still as marked as in 1929-30, the smaller paddock carrying three times as many stock per acre as the larger. This variation is largely due to the effect of intensive stocking on the smaller paddock.

Comparative Returns Per Cow Per Acre for the Last Four Seasons.

These results were computed on the same basis as in previous ears, as shown in the last report.

Production of Cheese.

	Cows Milked.	Cheese Production.
		lbs.
1927-28	28	1000
1928-29	32	1350
1929-30	35	1850
1930-31	39	2000

Production Per Acre.

Season.	No. of Cows.	Total Cheese Produced.	Cheese per Cow.	Percentage Increase on Previous Year per Cow.	Percentage Increase over 1927-28 per Cow.
		lbs.	lbs.		
1927-28..	28	1000	36	..	..
1928-29..	32	1350	42	16·6	16·6
1929-30..	35	1850	54	21·4	47·2
1930-31..	39	2000	51	−5·5	41·7

In the above it will be noticed that the production per cow was slightly below that prevailing in 1929-30, but this was more than compensated for by the total production per acre shown below.

Season.	Total Cheese Produced.	Area.	Production per Acre.	Percentage Increase on Previous Year.	Percentage Increase over 1927-28.
	lbs.	Acres.	lbs.		
1927-28..	1000	100	10·0	..	..
1928-29..	1350	100	13·5	35	35
1929-30..	1850	70	26·0	92·6	160
1930-31..	2000	70	28·8	10·8	188

The work to date has proved to be most satisfactory, and further improvement should be possible in the next two years, as the cumulative effect of the topdressing is brought into play. The marked decrease in the rushes and the general improvement in the quality and quantity of the herbage are highly gratifying,

and it is to be hoped that at the end of the period during which the trial will extend the lessons to be learned from the work will be of advantage to the farming community of the State.

ACKNOWLEDGMENTS.

The assistance and co-operation which have been forthcoming in the conducting of the trial have been most helpful. Mr. G. H. Napier's help and enthusiasm, along with Mr. W. Lohrey's recording, have enabled this report to be compiled in a highly satisfactory manner.

Our thanks are also due to the Electrolytic Zinc Company for its assistance in providing fertiliser where required.

GRAZING TRIAL—STOCK RECORD.

On the Property of Mr G H Napier
St Marys District.

Paddock No.	Stock Put On. Date.	Kind.	Number	Stock Removed. Date	Kind.	Number.	Date of Harrowing, Topdressing, etc.	Rainfall and Weather	General Remarks
	Nov			Nov					
7	7	Cows	37	8	Cows	37			Feed rough poor Quality
8	8	"	37	11	"	37			Good rough picking
9	11	"	37	12	"	37		44 pts	Feed improving but
10	12	"	37	14	"	37			only just getting good
1	14	"	39	16	"	39		13 pts	ditto
4	16	"	40	17	"	40			Feed here showing splendid quality and a good body
5	17	"	40	20	"	40		10 pts	Almost as good as No 4
3	20	"	40	22	"	40		1 pt	Wonderfully improved
6	22	"	40	24	"	40			Where top dressed for two years good
8	24	"	40	26	"	40		48 pts	Good feed but not liked by cows as well as 3 – 4 + 5
									The check plots are very conspicuous by absence of clover.

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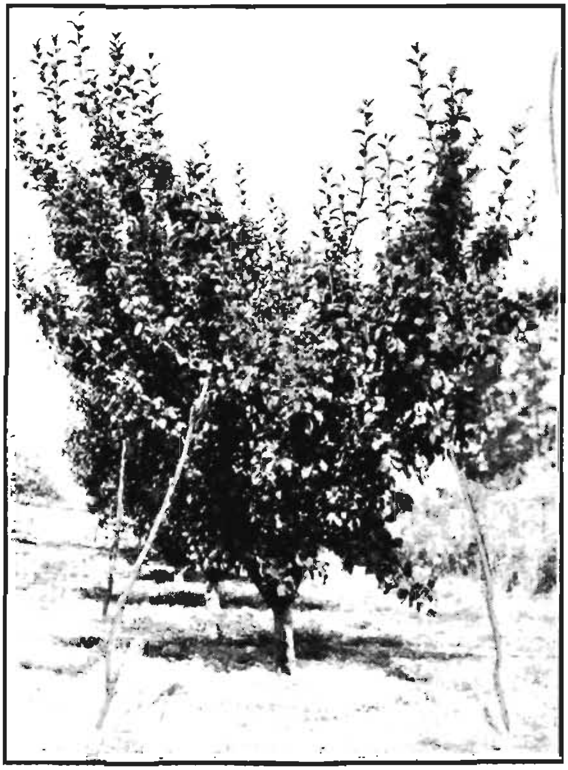
A typical page from the stock record book of St. Marys grazing trial.

APPLE VARIETIES RAISED IN TASMANIA.

1. Tasma (Democrat).

By P. H. THOMAS, Chief Horticulturist.

'ERY few fruitgrowers are aware that Tasmania, besides being ıe largest apple-producing State of the Commonwealth, has lso contributed some of the most valued varieties which are now ı cultivation throughout Australia and New Zealand. Whilst ıch year a number of new apples are evolved, either by natural

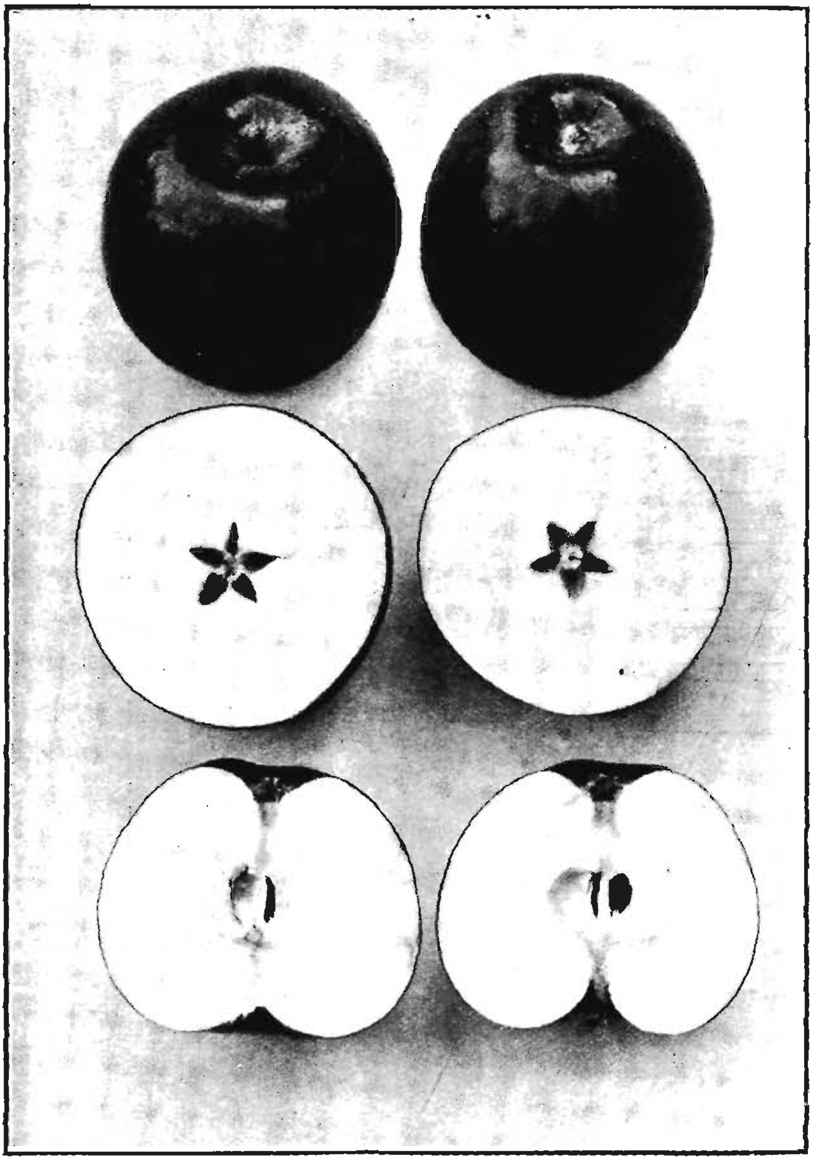


Tasma (syn. Democrat) apple, showing method of pruning, fruiting, and general characteristics.

or controlled hybridisation or by the chance production of sports, very few of these subsequently obtain a place in the fruitgrowing industry. The reason of this is obvious. To-day the planter has a choice of some hundreds of varieties, and any new apple must possess outstanding merits or be an improvement upon an existing kind before it receives consideration.

The apple sought after both by producer and retailer, if a dessert kind, must possess flavour, colour, and good keeping

and carrying qualities. The tree should crop regularly, be vigorous in growth, and not particularly susceptible to fungus or insect pests. Very few new apples will possess all these



Tasma (syn. *Democrat*) apple, showing vertical and cross sections.

merits, but occasionally one is raised that will fulfil most of the requirements, and after the natural prejudices of the trade to a new and unknown variety are overcome, its qualities may be

recognised, and the apple become a firm favourite upon the market.

Amongst all the apples which have been raised in Tasmania, Tasma, or Democrat, is the most popular throughout Australia. The variety originated as a chance seedling some 25 to 30 years ago at an orchard belonging to Mr. J. Duffy, of Glenlusk, in the Glenorchy district. The apple was first known as "Duffy's Seedling," and later as Democrat, but when it was recognised that another variety was in existence under this name, it was subsequently renamed Tasma. The parent tree is still to be seen by those interested, situated in a gully on the property, and regularly bears good crops of fine fruit.

Tasma is one of the best keeping, highly coloured, late varieties. It is this latter quality that was principally instrumental in bringing the apple into prominence. Whilst not possessing the delicate flavour of other kinds, it is eagerly sought after for dessert purposes, its deep brilliant red colour making a very attractive display in the show window.

During the younger stages of growth the fruits produced are rather larger than the sizes which are in popular demand. This is a good fault. When the tree comes to full bearing regular crops of the marketable sizes are produced, and the variety is not affected to the same extend as the smaller kinds under dry conditions.

The tree is markedly vigorous in growth, and possesses a peculiar angular habit that makes pruning and training rather difficult in the young stages. In order to secure early cropping, it is necessary that full use be made of the laterals. These should be encouraged, and only lightly pruned or shortened back to develop the fruit-buds.

Tasma, compared with other varieties, can be classed amongst those apples which are not particularly subject to fungus or insect pests. In the early stages of growth it sometimes suffers from the attacks of woolly aphis, but this may be controlled by a careful spraying, and when the tree is fully matured and the bark toughens very little trouble is experienced from this pest. The Tasma is now extensively planted throughout Tasmania, and has also found a certain amount of favour upon the mainland. During recent years it has proved a popular variety for reworking unsuitable or unprofitable kinds, its vigorous growth making it very adaptable for this purpose.

The fruits command the highest market prices towards the end of the season, and will often bring up to £1 per case for choice lots. Owing to its keeping qualities it is especially suited for cold storage purposes. and is often held until the end of December for the Christmas market. During a recent test fruits have been retained in storage for over 2½ years.

POMOLOGICAL DESCRIPTION.

Fruit:—

Form: Round-conic, regular.
Size: Medium to large.
Cavity: Deep, narrow, rounded, slightly russeted.
Stem: Variable, medium, thick.
Basin: Medium, wide, russeted, sloping, furrowed.
Calyx: Open. Tube: funnel-shaped. Sepals: erect, convergent.
Colour: Greenish-yellow ground colour, skin surface almost wholly covered with very deep red.
Dots: Grey, round, more numerous towards the basin.
Bloom: Scant.
Skin: Thick, tough, oily.
Flesh: Yellowish-green, crisp, fine-grained.
Core: Medium emarginate. Carpels: cordate. Axile seeds: large, wide, plump.
Quality: Good. Flavour: dry, sweet and pleasant to taste.
Season: Very late, fruits have often been kept in cold store over 12 months.

OLD PASTURE RYEGRASS SEED.

Most commercial lines of English or Perennial Ryegrass are not of a truly perennial habit, and usually contain a high percentage of seeds capable of producing only short-lived plants. If such seed is sown it frequently happens that after the first season there is a very marked thinning of the sward through the dying off of the temporary elements. This is one reason why " English fails to hold " on much of our country.

Farmers contemplating the sowing down of pastures are advised to save as much seed as possible from old headlands or any old established pastures they may have. Such seed is of a truly perennial habit, and is worth infinitely more than ordinary commercial lines.

An alternative is to procure a bushel or two of the best certified old pasture Hawke's Bay ryegrass, and sow this as a seed plot. The seed crop may be stripped or cut with a binder, and yields of 20 or 30 bushels are usual.

REGULATIONS UNDER THE DAIRY PRODUCE ACT, 1930.

By J. T. ARMSTRONG, B.Sc. (Ag.), Chief Dairy Officer.

THE regulations under the Dairy Produce Act, 1930, have now been gazetted, and will be in force as from 25th August.

Realising that to enforce the regulations in full would, at the present time, cause undue hardship to many dairymen who are struggling against the disadvantage of low prices for their produce, the Department is prepared to waive certain sections of the regulations for this year only. The sections to be waived for the time being are those referring to the standards required in the construction of milking-sheds and dairy-houses.

It is strongly recommended that all dairymen who can possibly afford to do so should erect proper sanitary and hygienic milking-sheds and dairies, but action will not be taken this year against dairymen who have not got concrete floored milking-sheds and dairies where it is shown that provision of proper buildings would cause undue hardship.

It is intended, however, to enforce all regulations in respect to cleanliness of premises, cows, attendants, and utensils; to condemn utensils which are unsuitable for use in connection with dairy produce; to insist on registration of premises and on the proper marking of dairy produce. The regulations to be enforced are as follows:—

I. All dairymen to apply for registration of their premises; application forms will be available at the Department of Agriculture, Hobart, Launceston, Scottsdale, Devonport, Burnie, at butter and cheese factories, and at municipal councils.

II. All milking-sheds and dairies must be properly drained, and the drains may lead into a trapped gully, or to a receptacle approved by an inspector, which shall be large enough to hold one day's flow of drainage, and must be at least 30 feet away from the shed. All drains to be trapped, and the solid matter collected in the traps to be removed daily.

III. All milking-sheds and dairy-houses shall be kept clean, and, when required by an inspector, shall be disinfected, lime-washed, or painted.

IV. No pigs or poultry shall be allowed to enter milking-sheds or dairy-houses.

V. No sour milk or unclean buckets shall be kept in the dairy-house or where dairy produce is stored.

VI. Provision shall be made for sufficient water to be available for washing out the shed and dairy-house, and for washing cows' udders and teats, the milkers' hands, and all utensils. The supply may be under pressure or from tanks, but water under pressure is preferable.

VII. There must be sufficient boiling water available to permit thorough scalding of all utensils. A copper is recommended for this, since, after washing, the utensils may be placed in the copper, and kept in boiling water for 5 to 10 minutes.

VIII. All manure or offensive matter of any kind within 150 feet of a milking-shed or dairy-house shall be collected daily, and either carted well away or stored in a suitable bin at least 150 feet away from shed or dairy, and this bin shall be emptied when the contents amount to 2 square yards. The construction of the manure-bin to be to the satisfaction of the inspector.

IX. Prior to milking, the udders and teats of the cows and the milkers' hands are to be properly washed, and conveniences to enable this to be done must be provided.

X. The milk from diseased cows, from cows within 15 days before and 5 days after calving, and the first jets of milk from each teat—must not be mixed with the milk from the rest of the herd.

XI. Cream stands to be erected at road side to protect cream from animals and from the direct rays of the sun.

XII. All utensils used for dairy produce shall be properly tinned, and shall have all seams and sharp corners properly floated so that they can easily be cleaned.

All dairymen manufacturing farm butter must register with the Department their mark by which their produce will be known.

A name and address, or some fancy name, as "Clover Field," may be registered, and must be stamped on the wrapper of all butter manufactured. In addition to the registered mark, the words "Farm or Dairy Butter" must be stamped on the wrapper.

A fee of 2s. 6d. is prescribed for registration of a "mark."

These regulations will be administered by local health authorities and by officers of the Agricultural Department.

In respect to factories the regulations are more stringent, since unless the factory is properly constructed and equipped, and its operations are properly carried out, it is useless for farmers to go to the trouble and expense of producing choice cream. The factory is the keynote of the industry, and the success of dairying depends largely on the successful operation of the factory.

Factories will have to conform to the requirements of the regulations as to construction and equipment, and no factory will be registered which does not comply with these requirements. In approved cases provisional registration will be granted to give the boards of directors time to effect necessary improvements. It is pleasing to note the manner in which the various factories are facing up to their responsibilities, and are effecting the necessary improvements, without waiting for the Department to enforce the regulations, and it is hoped that dairymen generally will face the position in the same spirit as the factory directorates.

Another very important section of the regulations which will be rigidly enforced this year refers to correct grading and testing.

Every factory must employ certificated testers and graders, and their work will be closely checked during the coming season. If a case occurs where it is found that a tester or grader has become incapable of performing his duty properly, or where it is found that a tester or grader is awarding wrong tests or grades, the Department will exert the authority it possesses under the new Act, and suspend or cancel the certificate of the offending tester or grader. The old Act did not make provision for cancellation of certificates, and did not afford adequate opportunity for checking the operations of these men, but the new Act gives the necessary authority, and will enable departmental officers to check up closely on the work of these operatives.

The enforcement of these sections of the Act will be a safeguard to suppliers, ensuring that they will be correctly paid for their produce. This should result in the confidence between factory, supplier, and Department which is essential if success is to follow the efforts of all concerned to uplift the quality of our butter. If a farmer's cream is graded choice whilst in reality it is second grade, that farmer has no incentive to improve his methods, and his cream will remain second grade. Neighbouring farmers, knowing his methods are slovenly, but that he obtains top prices, will have a tendency to follow his example and permit their methods to become faulty.

On the other hand, if a farmer's cream is graded down, he can feel certain that something is wrong, and will look for the cause of the trouble, whereas if he is doubtful that his cream is being correctly graded, he is more apt to blame the grader, and to do nothing to improve his own methods.

The sections of the Act dealing with correct marking and branding of dairy produce will be enforced. All factories will have to register a mark by which their produce may be identified, and this mark will have to be placed on all produce manufactured. In addition to the registered mark, a registered brand will also be required to indicate the grade of the produce.

Thus, each butter factory will require to register a mark and four brands, one brand to indicate choice butter, one first grade, one second, and one pastry grade.

Close attention also will be given to the transport of cream to factories to see that the regulations in this respect are being complied with. These regulations refer to cleanliness of vehicles and proper protection of cream from the sun, and were framed to ensure that a farmer's cream will be given the best attention from the time it leaves the farm until it arrives at the factory, and to limit the possibilities of contamination during transit.

Copies of extracts dealing with the regulations which will be enforced in respect to dairies are available at all offices of the Agricultural Department, and the full regulations are on sale at 6d. per copy at the departmental offices in Launceston and Hobart.

A number of enquiries are being received with reference to details of milking-sheds and dairies, and to meet this demand plans of these buildings are also available at the offices of the Department. It is not required that sheds and dairies be constructed according to these plans, but they have been prepared to serve as suggestions to farmers who have no detailed knowledge of shed-construction.

To aid farmers who wish to put down concrete floors, and who have had no previous experience with this class of work, an article on the subject was published in the last issue of the Journal (August, 1931).

Too much stress cannot be placed on the necessity for proper buildings on the dairy farm, and while the Department is waiving the regulations in certain cases this year, it is not because proper buildings are not regarded as essential, but solely because it is realised that certain farmers may not be able to provide for these improvements at once. It is hoped that all dairymen will obtain particulars of the regulations which affect them, and bring their methods into line with the requirements. If this is done willingly it will greatly reduce the work of the departmental officers, and enable them to devote more of their time to the task of assisting farmers who may have brought their premises into line, but for other reasons may experience difficulty in producing the choice grade article which is required.

ANSWERS TO ENQUIRIES.

Question.—What method is recommended for washing dairy utensils?

Answer.—An effective method of washing utensils is as follows:—

(1) Rinse with cold or warm water.

(2) Wash all utensils and separator parts in hot water to which washing-soda (1 oz. to 4 gallons) has been added. Use a scrubbing-brush, not a rag, to assist in cleaning the parts thoroughly.

(3) Immerse separator parts and all utensils in boiling water, and keep at the boil for 10 minutes. Remove from water and place upside down on a clean rack, or hang on pegs, to drain thoroughly. The separator parts and all utensils must be washed immediately after each milking.

—*Dairy Division.*

Question.—Can you prescribe effective treatment for greasy heels?

Answer.—Greasy heels are due to an inflamed condition of the skin brought about mainly by exposure to damp followed by cold winds. It is manifested by a discharge and cracking of the skin at the back of the fetlock.

The hair surrounding the part should be clipped, and the part cleaned up with a suitable antiseptic, such as a teaspoonful of lysol to a pint of warm water.

The part should then be dried, and an ointment, consisting of equal parts of zinc ointment and iodoform ointment, should be applied daily. In mild cases astringents and irritants, such as bluestone, should not be used.

Keep the stable clean, and expose affected animals to damp and cold winds as little as possible.

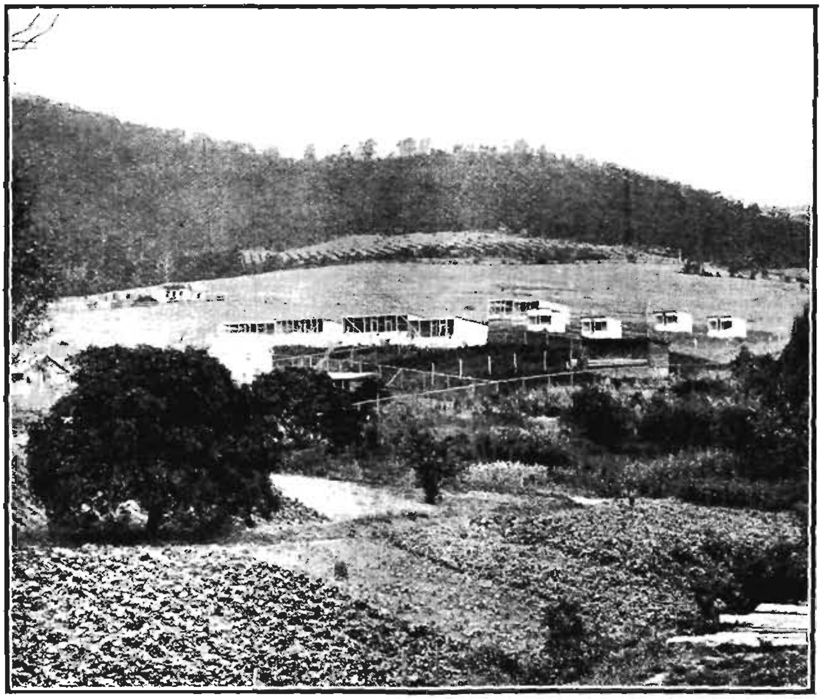
—*Veterinary Division.*

POULTRY-FARMING AT NEW NORFOLK.

By A. E. Powell, Assistant District Organiser and Poultry Husbandryman.

A little over three years ago a start was made to build up the poultry section at the New Norfolk Mental Hospital farm to ensure a supply of fresh eggs and table poultry for the institution. A commencement was made by the purchase of breeding-pens of birds consisting of White Leghorns and Black Orpingtons, which were placed in a reconstructed building which previously had been used for the limited number of poultry then kept on the farm. This building consisted of one open-fronted fowl-house, which had to be altered for the accommodation of the two pens of breeders.

The incubation for the first year's operations in 1928 was carried out by means of one small machine and broody hens. The plant has since been extended, until at present there are three electric incubators and one electric brooder in use. These are housed in separate well-ventilated buildings. In addition, laying-houses have been built for 600 layers and colony house accommodation for the rearing of a similar number of young stock. This development is illustrated by the following photograph:—



Present Up-to-Date Poultry Farm.

In this photograph it will be seen that the buildings have been constructed of wood, with galvanised iron roofs. Cemented floors are provided in the houses, while labour-saving devices and up-to-date improvements for watering, nesting, and roosting under hygienic conditions are made use of. Special attention is also given to the supply of an abundance of green food.

It will readily be seen from the following statement that the improved methods now operating at the institution are well worth the attention of all those interested in the economics of poultry-farming

First Year's Loss.

Stocktaking of the poultry on 1st April, 1929, showed a total of 127 birds. The trading year ceased on 31st March, 1930, when there were 503 birds on hand. During that period a loss of £67 16s. 5d. was incurred. In view of the fact that the building up of stock for future operations was the main objective, this loss was anticipated. The transactions during the period under notice were as follows:—

		£	s.	d.	£	s.	d.
1929.	To stock on hand	12	14	0			
Apr. 1.	To purchase of grain, &c.	89	3	9			
	To wages	162	1	7			
	To cartage	5	0	0			
1930.	To fuel, light, water, and power	2	10	0			
Mar. 31.	To rates and taxes	2	0	0			
	To interest	19	9	7			
					292	18	11
	By sales	121	5	8			
	By stock on hand	103	16	10			
					225	2	6
	Balance, being net loss on first year's operations				£67	16	5

Second Year's Profit.

The second year, which closed on 31st March last, revealed a profit of £54 14s. 10d. At the close of the year there were 742 birds on hand, and 5805 dozen eggs were produced in addition to those used for incubation.

The detailed and audited transactions were as follows:—

		£	s.	d.	£	s.	d.
1930,	To stock on hand	103	16	10			
Apr. 1	To purchase of grain, &c.	159	0	2			
to	To wages	255	18	5			
1931	To cartage	3	15	0			
Mar. 31.	To fuel, light, water, and power	2	10	0			
	To rates and taxes	2	0	0			
	To depreciation on buildings and plant	5	18	4			
	To interest	26	17	7			
	To net profit	55	14	10			
					595	11	2
	By sales	447	19	6			
	By stock	147	11	8			
					595	11	2

These figures have been audited by the Government auditor, and demonstrate that in addition to providing wages the venture has left a satisfactory margin of profit.

MAMMITIS IN COWS.

By D. T. OXER, B.V.Sc., Veterinary Pathologist.

MAMMITIS is a disease of the udder. It is contagious, that is, it can be spread from one cow to another. The disease is caused by a variety of germs which usually infect the udder by passing up the teat canal. Another method of entry is through external wounds, such as those caused by horns, stakes, &c.

SYMPTOMS AND PROGRESS.

Although all cows in milk are susceptible, those most likely to be affected are, generally speaking, heavy milkers. This is particularly so when cows are coming in, as at this time the udders are often swollen and firm.

A cow which becomes affected by an acute form of the disease will show general symptoms of sickness, such as fever, harsh staring coat, dullness, and anxious expression. In addition the affected quarter or quarters of the udder will be very swollen, hot, and tender to the touch. The cow will very often walk with a straddling gait, in order to avoid undue pressure on the swollen udder. The milk also shows changes. It will at first be clotted and stringy, but as the disease progresses it will change to matter or pus, and will be withdrawn with difficulty.

In many cases there are no signs of general sickness, there being only a temporary clotting of the milk, which may pass off after a day or so.

If treatment is successful, the use of the quarter will gradually be recovered, and the milk will assume its normal character. If treatment is not successful, the quarter may gradually become green and gangrenous, when it may drop off; or abcesses may form. The quarter may become hard and fibrous, and it will be very difficult to again get it to function properly.

TREATMENT.

Treatment must be started as soon after commencement of the disease as is possible, and should be carried out along the following lines:—

1. First give a purgative (such as 1 to 1½ lb. Epsom salts, ½-lb. treacle, 1 tablespoonful of ginger, dissolved in 1 quart of water).
2. The affected quarters should be milked out every three hours (throughout the whole 24 hours if possible).
3. Apply hot foments three times a day.
4. Massage the quarter after fomenting, using olive oil or camphorated oil. The milking-out should be done as often as possible, as the milk is not then available for the germs to grow in.

Spread of Disease and Its Prevention.

The disease is spread under filthy conditions, although even in an apparently clean dairy it may make its appearance. The germs may be carried from one cow to another by milkers. Dirty, soiled hands from utensils and dirty stools, and also milking-machines, are means of carrying the infection.

To combat these ways by which infection is spread, rigorous cleanliness and hygiene should be the order in every dairy. Wash the udders of the cows before milking, and disinfect floors, utensils, and machines (sodium hypochlorite is good for this purpose), and also the hands.

Above all, keep diseased cows separated from the rest of the herd. Keep a separate set of buckets, &c., for diseased cows, and attend to them only after the other cows are finished with.

Chronic Carriers.

Sometimes cows which have had the disease become chronically affected, and may be a constant source of danger to other cows. These can be detected by examination of the milk at the Laboratory, Launceston, from which sterilised sample-bottles are forwarded on request. Sterilised bottles may also be obtained from local district agricultural organisers.

All dairy farmers are advised to obtain a copy of the Department's Circular No. 3, dealing with the prevention and treatment of this disease.

MINERAL FOOD FOR PIGS.

Such a rapidly growing animal as the pig requires large amounts of mineral matter in order to build up its skeleton and to maintain the functions of its body. In addition to phosphates and other mineral matter, a three-months-old pig requires a third of an ounce of lime per day, while a milking sow will lose 1½ ounces of minerals each day in her milk. Lack of sufficient mineral food results in the pig becoming unthrifty and stunted. The following mixture should be available to the stock at all times:—

Charcoal	20 parts
Hardwood ashes	20 parts
Sterilised bonemeal	10 parts
Coarse salt	8 parts
Slaked lime	4 parts
Sulphur	4 parts
Sulphate of iron	2 parts

POTATOES.

Methods of Avoiding So-called "Running Out."

By C. E. W. OLDAKER, Agronomist.

IT is the belief of many farmers engaged in potato-production that any variety which has been grown for a number of years in one locality "runs out" merely through old age and weakness, and for this reason alone a change of "seed" is thought necessary. Such changes are sometimes still made without clear appreciation of the "why," and they may result in crop yields being even worse than if the grower had retained his own seed stocks.

Through the knowledge that a change from high inland districts to coastal farm lands will frequently prove highly beneficial, the practice of an annual introduction on these lines is now very popular. The attention to detail has, however, not gone far enough, and the flat rule of simply buying potatoes from high country to be employed as seed is extremely unsafe. Disappointment and financial loss are frequently the unenviable results of careless buying. In every case a thorough examination of growing crops should be made, and lines exhibiting undue incidence of leaf-roll and mosaic—diseases primarily responsible for "running-out"—should be rigidly excluded from a seed purchase.

A condition which during recent years has multiplied to an alarming extent amongst our main crop—Brownells—is infection by the virus disease known as mosaic, and to a lesser degree rugose mosaic in the early Bismarcks. Although articles dealing with the subject have appeared in previous numbers of this journal, no apologies are offered for again devoting space to so serious a matter.

The outward manifestations of virus diseases have long been known, and it is at least a century ago since one form, known as leaf-roll—in Tasmania principally found in the white-skin tuber group—first came into prominence in Great Britain. In spite of this, intensive study of the diseases has been carried out only during modern times. Only 11 years ago was it first discovered that these diseases are transmissible from plant to plant, as well as being carried on through the agency of the seed. This transmission from diseased to healthy plants may occur freely in the field if both are grown together under mild climatic conditions in which insects will thrive.

While it appears to have been proved that other insects, such as leaf-hoppers, fail to transmit virus diseases, the aphis or green fly known as *Myzus persicæ* is definitely responsible as a carrier. Mr. R. A. Scott, of the Agronomy Division of the Department, has done some work in connection with the identification of sap-sucking insects in Tasmania, and it has been found that *M. persicæ* takes a prominent place amongst the species and numbers present.

Seeing that mosaic is prevalent amongst potato stocks, it is impossible to produce healthy seed in coastal districts of low altitude where insect life abounds. One exception has come under notice in which a strain grown almost at sea-level in the far north-west has provided good results. This is, however, due to the fact that isolation from any other potatoes is so complete that, even with the aphis present, there cannot be infection if the crop was originally healthy.

Therefore growers are looking to the high inland districts, in which harsher climatic conditions contribute to the production of healthy seed through the comparative absence of aphis.

That high-country growers can materially improve the State average yields per acre, and incidentally their own financial position, through the exercise of good methods is undeniable, but except in a limited number of cases the true signficance of the position is not realised.

Growers are content to go on and give their stocks another try instead of thoroughly adopting means of improvement advocated by Departmental officers.

During the season 1929-30 a vigorous campaign by the Plant Pathologist, assisted by other officers of the Department, was carried out in order to further the object of encouraging production of reputable seed amongst high-country growers.

During a preliminary survey it was soon found that growers were loath to adopt the apparently drastic method of entirely rogueing all diseased plants from a potential seed crop, such as is the known practice amongst advanced Scottish seed-growers. Costly seed had been planted, a loss appeared to be entailed, and thus the complete co-operation of individual farmers was almost impossible to secure.

The alternative method of selecting and staking approved plants conforming to type and health was then adopted, and during the course of some well-attended field days throughout north-western districts and in the midlands some useful work was done. Reference to Issue No. 1, Vol. I., of this Journal will show the complete plan recommended to growers. This indicates that the staking of plants is a first step only, to be followed by other essential operations to form the nucleus of a stud seed plot.

It is regretted that, in most cases, this necessary attention was not given except by a moderate number of growers in the midland seed Bismarck country and a smaller proportion throughout north-western seed Brownell producing districts.

The principle of selecting plants for health by the condition of their tops is sound. Staking identifies those plants after the haulms have died down.

At digging time it is equally desirable for the grower to select for yield of tubers. He may set as his standard six, eight, or any number of marketable tubers from the staked plants, discarding those which do not carrying this number.

In this way he will secure a nucleus of comparatively healthy, high-yielding plants for his stud plot.

Following the selection of seed, all the other practices for successful growing must be adopted, otherwise the staking or any other system will break down. Growers must recognise the necessity for incorporating a method of seed selection and stud plots into the annual farm routine, otherwise there will be continued loss from " running out " or degeneration diseases.

By far the soundest plan, however, is to select a quantity of the best seed available, and, growing it in a reasonably isolated position, put into operation a complete rogueing of all off-type and diseased plants. No half measures will suffice. The source of infection should be eliminated as far as possible by the removal of all degenerate plants as soon as they can be identified.

The aim of every high-country grower should be to establish this system as one of his important yearly activities. Approximately one-tenth of the usual area cropped should be sufficient to provide seed requirements, and by this method not only will his yields be increased, but his seed should also command advanced prices from growers in the coastal districts.

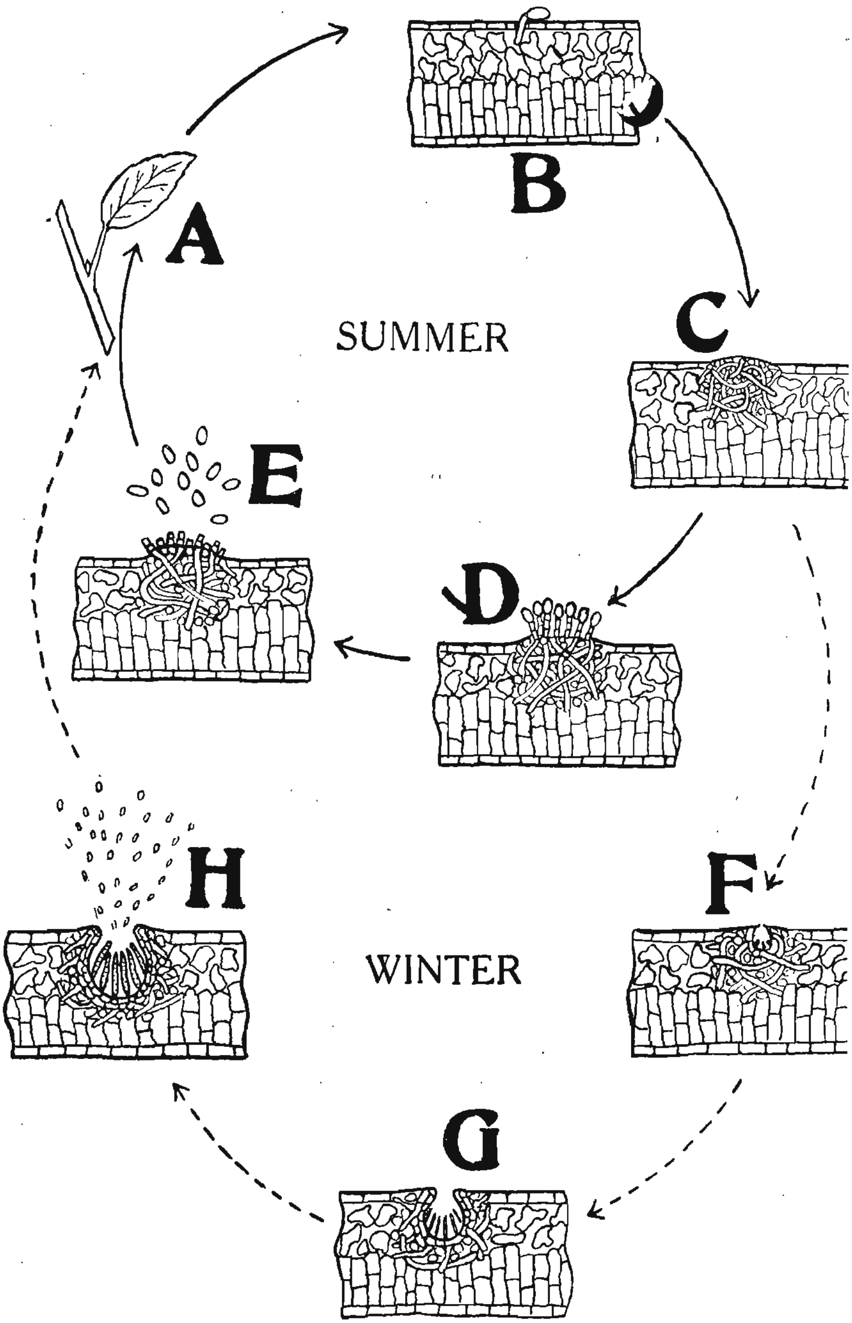
During the past two years, for the benefit of growers who are desirous of securing reputable and profitable strains, the Department has inaugurated a scheme for advice and assistance in the production of seed. That the need is recognised has been amply proved by the manner in which advantage has been taken of this facility, and many of the seed-growers listed report an entire clearance of stocks many months ago, with provisional orders offering for next year.

The method employed is a survey of all high-country districts suitable for seed-production, and examination of individual crops. At the same time growers are advised in methods of improvement, including seed selection, rogueing, seed treatment, and cultural work.

The approved crops are listed, and the information promulgated, through district agricultural organisers, to all branches of the Bureau.

It is pleasing to note the manner in which a number of growers, working under favourable conditions regarding altitude and climate, have taken a move in improvement of stocks through selection and rogueing. The practice is extending, and it is safe to say that a distinct step forward has been made in raising the standard.

That quality of the seed is the most important single factor in potato-production is beyond dispute. Every other condition may be right, but weakness in this respect entails certain failure. The importance and value of good seed are gradually being recognised.



DIAGRAMMATIC REPRESENTATION OF LIFE HISTORY OF THE BLACK SPOT FUNGUS.

DEVELOPMENT OF SUMMER SPORES.

A. Spores, either conidia or ascospores, come into contact with the leaf or fruit **B.** A spore germinates and the germ tube pierces the cuticle. **C.** The germ tube develops *into a mycelium.* **D.** *The mycelium develops conidia.* **E.** *Conidia are released and repeat* the cycle.

DEVELOPMENT OF WINTER SPORES.

F. After leaf fall the mycelium continues to develop and forms perithecium. **G.** The perithecium develops and contains asci. **H.** In spring the asci release ascospores, which carry infection to the new leaves.

THE LIFE HISTORY OF THE BLACK SPOT FUNGUS.

By H. M. NICHOLLS, Microbiologist.

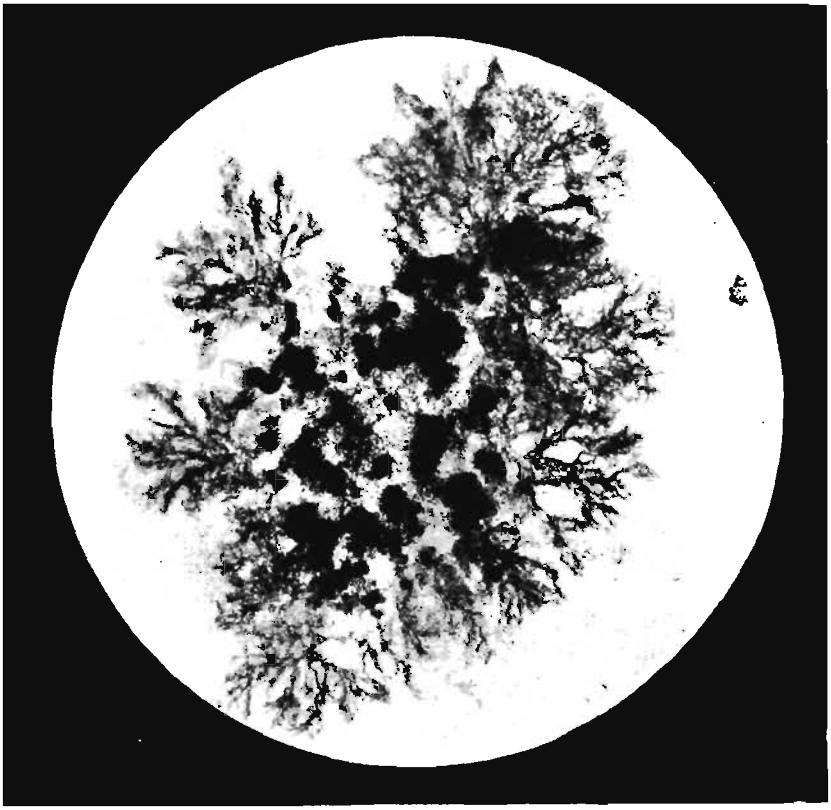
WITH the exception, perhaps, of the powdery mildew, black spot is the most destructive fungus disease that the Tasmanian orchardist has to contend with; and it is becoming more apparent every year, since the writer first described the significance of the ascigerous stage of this fungus about 25 years ago, that it can never be satisfactorily controlled until its life history is thoroughly understood by every fruitgrower.

Black spot has probably existed as long as the cultivated apple itself, but it is only in comparatively recent times that it has become a serious problem to the orchardist. It was unknown, or at least not sufficiently destructive to attract attention, in Tasmania until about 35 years ago, when it began to spread with great rapidity through all the fruit-growing districts of the south. Very few fruitgrowers at that time knew what it was, or had any rational ideas in regard to its treatment, and consequently it caused great loss. It is noteworthy that the appearance of this disease as a serious pest coincides with the introduction of what at the time was called " intensive orchard cultivation," and the logical conclusion to be drawn from this remarkable coincidence is that the black spot existed in Tasmania previously, but never became a serious trouble until intensive cultural methods gave it an opportunity of developing and dispersing itself.

The black spot fungus belongs to a family of some extent, but the individual members of it are confined very strictly each to certain species of plants or trees. The black spot of the apple, for instance, will not grow on any kind of tree or plant except the apple and its varieties, the latter including the ornamental kinds grown in gardens; and the black spot of the pear will grow on nothing but the pear. Orchardists are only concerned with the black spot of the apple and pear, and both these fungi have two stages in their life history. These stages differ very much from one another in appearance. In the first stage both fungi are active parasites, and attack the living leaves and growing fruit, but in the second they are saprophytes, living entirely on the fallen leaves or on fallen and rotting fruit. The first phase is known as the conidial stage, and is the one seen by the fruitgrower on his trees. The conidial stage was for a long time known under the name *Fusicladium dendriticum* in the case of the apple spot and *F. pirinum* in the case of the pear spot. The winter stage of the apple spot was for a long time known as *Sphærella inæqualis*, but the connection between the two forms was not suspected until about 35 years ago, when their relationship was demonstrated by Aderhold.

As soon as the young leaves and fruit appear, the spores of the winter stage are ready, as a rule, to be discharged from the

dead leaves. If one of them alights on a young leaf or fruit, it begins at once to germinate, and puts out a long germ tube, which pierces the cuticle and begins to grow beneath it, deriving its nourishment from the parenchymal cells just below. As it grows it branches out into a tree-like growth of flattened cells, which gradually extends until a visible " black spot " is formed. It is from this tree-like form of growth that the conidial stage of the fungus took its specific name of " dendriticum." Here and there dense masses of conidiophores, or spore-bearing organs, are



[H. M. Nicholls, Photo.

Patch of Black Spot on skin of apple, showing the tufts of conidiophores in the centre and the dendritic mycelium. [x 25.]

formed, which rupture the cuticle and produce myriads of dark-coloured conidia or summer spores. Each conidiophore bears one conidium. The conidia soon become detached from the parent stem, and are blown about by the wind in uncountable numbers. Wherever one alights on a leaf or young fruit it reproduces the disease, and this process goes on nearly the summer through if the weather conditions are favourable. The conidial stage is the dispersive one, in which the fungus spreads

itself. The conidia, though somewhat shortlived, can be carried for long distances by moist winds and still preserve their vitality. As the growing period of the tree reaches its conclusion the development of conidia declines, and when the leaves begin to turn yellow and fall it ceases entirely.

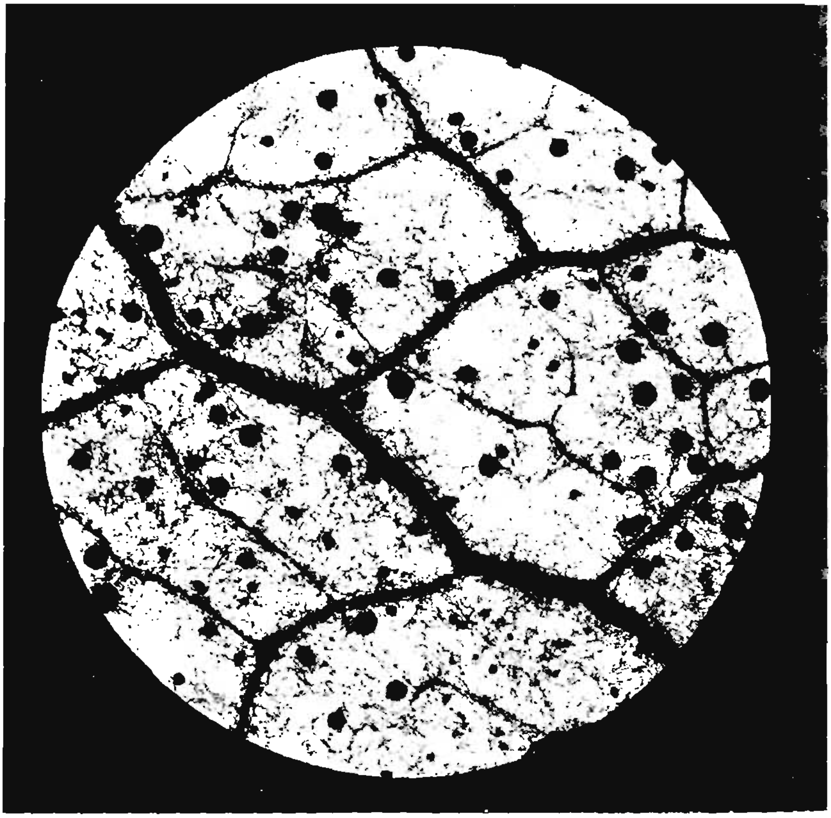
When the leaves have fallen to the ground the fungus changes its habit and appearance, and takes on the saprophytic form. The flattened dendritic mycelium of the summer stage begins to grow out into comparatively coarse brown fungus threads, which

[H. M. Nicholls, Photo.

Black Spot on leaf, showing tufts of conidiophores and fallen conidia. [x 250.]

branch and penetrate the interior of the leaves in all directions, until they are filled with a tangled mass of filaments. As spring once more approaches small dark-coloured receptacles, known as perithecia, are formed at intervals on the fungus threads. The perithecia, which are barely visible to the unaided eye even when placed on a white background, are hollow, with membraneous walls, and inside them are formed numerous little closely-packed,

colourless, sausage-shaped bags or asci, each of which contains eight spores, which are the ascospores. The ascospores are quite different in appearance from the conidia, and possess distinctive properties. A conidium consists of a single cell of a brownish colour, and in outline suggests a human footprint, but the ascospore consists of two unequally-sized cells, is of a greyish-brown colour, and the shape of a blunt-ended egg. The winter, or saprophytic, stage is the means by which the fungus is carried over from one season to another.



[H. M. Nicholls, Phot.

Perithecia of *Venturia inaequalis* in apple-leaf. (The leaf has been rendered transparent with a chemical that does not affect the colour of the fungus.) [x 25.]

The ascospores are produced in enormous numbers. In one small piece of leaf in the writer's possession, which is about half an inch square, there are about 1000 perithecia, and the average content of each, as far as it is possible to count them, is 300 asci. Each ascus always contains eight ascospores, so that this little scrap of leaf alone is capable of producing 2,400,000 spores as its initial contribution towards the reproduc-

tion of the species. This, of course, is an exceptional case, and is only mentioned to show what the fungus is capable of under favourable conditions.

When the ascospores are ripe and ready for discharge, they are shot one after the other out of an opening in the top of the ascus, and reach the outer world through the ostiole or mouth of the perithecium. This discharge only takes place in the presence of moisture, and may be induced by rains or heavy dews. It may be accepted as a working hypothesis that the

[H. M. Nicholls, Photo.

Asci with ascospores of *Venturia inæqualis*. [x 300.]

ascospores will be at least as numerous as the summer conidia in any orchard; that is to say, that if a large number of leaves are infected, there will be a correspondingly large formation of ascospores. It is on an inspection of the leaves that the orchardist must base his estimate, for the black spot is essentially a leaf disease, and its presence on the fruit is only an accident, and is in no way necessary to the reproduction or perpetuation of the fungus. It is by no means an infrequent happening to find the leaves infected when there is no black spot on the fruit at all.

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As far as the apple spot is concerned, the whole problem of black spot control in Tasmania centres about the winter stage, because if the ascospores can be kept from reaching the trees in the spring and early summer, the chain of development of the fungus is broken. The easiest and most effective way of dealing with the dead leaves is to plough them in as soon as they fall. Once they are buried they are attacked by saprophytic soil fungi and bacteria and rot away, and the fungus is deprived of its food. If the leaves are left lying on the ground all the winter, as is the usual practice, the fungus develops in them unchecked.

The ascospores are ripe and ready to be discharged in normal seasons about the time that the orchard trees come into flower, but their behaviour is largely dependent on the weather. If the spring is a very dry one, they may not appear at all, or only in very small numbers, or the discharge may be delayed until rain falls, but under ordinary conditions there is a fairly regular discharge for at least eight weeks. The majority of the spores are discharged on or into the ground, and remain there as long as they are undisturbed by wind or mechanical agencies. As soon as the ground is disturbed the spores are liberated, and are carried to the trees by every puff of wind. This explains why the scarifying of the ground in the spring always leads to a great increase in the amount of spot to be found on the leaves and fruit.

There is no doubt that it was the introduction of the so-called "intensive orchard culture" which was responsible for the enormously increased incidence of the disease, because it was one of the cardinal points of this system that there must be continual spring cultivation. A more fatal proceeding, where the black spot is concerned, it would be difficult to imagine, for the continued disturbance of the soil gives the ascospores an enormously increased chance of reaching the trees and reproducing themselves.

The intensive system was copied from the practice which prevailed at the time in the hot and dry fruit-growing areas of California, and the writer has very often questioned whether it is the best for Tasmanian conditions. Even in hot and dry California there has been much the same experience in connection with the black spot as there has been in Tasmania, but the Californians have been wise enough to alter their methods to meet the new conditions. In Tasmania most orchardists still blindly follow the teachings of the "intensive culture" enthusiasts of 35 or so years ago.

All dead leaves should be ploughed in directly they fall, if it is the intention of the orchardist to scarify his orchard in the spring. If they have been buried for at least three months, the scarifying may be undertaken with some degree of safety.

In dealing with the black spot, cultural methods form the first line of defence, and should never be neglected.

Spraying is an important aid in dealing with the disease, but should not be depended upon as the sole means of defence. Provided that it is applied at just the right time, one spraying

alone may check the appearance of the disease; but the right time is very difficult to judge. If there is a wet spring, the discharge of the spores will be earlier than usual, and infection may take place before the spray is applied. If the spring is a dry one, the discharge may be delayed, and the spray may miss the spores altogether. The best general rule for the orchardist to follow is to apply a thorough spraying of Bordeaux mixture at what is known as the "green tip" stage, giving later sprayings as required.

All methods of controlling the black spot are purely preventive and not curative. Once the leaves or fruit become infected no cure is possible, because the vegetative part of the fungus is under the skin and quite out of reach of sprays. In the case of the black spot it may be truly said that an ounce of prevention is worth many tons of cure.

The life history of the black spot of the pear is the same as that of the apple, but the ascospores of the former appear earlier than those of the latter. The ascospores of the pear spot are different in shape and colour from those of the apple spot. They are more elongated or spindle-shaped, and instead of being a greyish-brown in colour they are a greenish-grey. The inequality in the size of the cells of which they are composed is much more marked, and in many cases there is a trace of a second septum or division, indicating that the spores are really composed of three cells in some cases instead of two.

The pear flowers earlier than the apple, and the ascospores of the pear spot are ready to make their appearance, in normal seasons, as soon as the pear buds begin to open. In one important respect the pear spot differs from that of the apple. The latter very rarely attacks anything but the leaves and fruit, but the black spot of the pear grows very freely on the twigs and shoots. The mycelium in the areas so attacked appears to be perennial, and crops of conidia are produced every year. These diseased shoots should be looked for very carefully during the winter, and cut out and burned. This habit of the pear spot seems to have had a reflex action on the ascus formation, for the asci are never formed in such numbers as in the case of the apple spot. In Tasmania it is rare to find a perithecium of the pear spot which contains fifty asci, but in the case of the apple spot perithecia containing two or three hundred asci are quite common.

Since the life history of the black spot fungi has been worked out the names of the organisms have been altered. The apple spot is now known scientifically as *Venturia inæqualis* and the pear spot as *Venturia pirina*.

VETERINARY SERVICES.

By T. PHILP, L.V.Sc., Chief Veterinary Officer.

IN all civilised countries there are established organisations which have for their function the maintenance of animal health, and the more a country's interest is devoted to livestock, the more important do veterinary services become.

This article deals with the general principles of veterinary organisations, and later on an opportunity may be afforded to describe the application of some of those principles in so far as they relate to Tasmania.

Diseases are no respectors of times or places, and ancient and modern history records the ravages of animal scourges in different parts of the world. From the earliest times there have been students of animal diseases, and Virgil in his poems not only reveals a good knowledge of animal husbandry, but also describes fairly accurately the symptoms of many diseases, ascribing them, not to bacterial causes, but to the influence of the stars or the malevolence of the gods.

Veterinary science has evolved in the same way as human medical science, through periods of error and superstition, until it has become one of the most exact sciences, and this has led to veterinarians specialising in the different branches of their profession.

Its development has naturally followed the domestication of animals, and as a country develops along agricultural lines, so the need for veterinary services increases as intensive methods of animal husbandry bring along their own particular troubles. These methods lead to the concentration of animals on small areas, with a greater risk of parasitic infestation and bacterial diseases, as well as diseases due to unbalanced rations and to over-nutrition.

In Australia the need for these services is being increasingly recognised, and very notable work on the investigational and administrative side has already been accomplished by Australian veterinarians. The chief veterinary officer of a country stands in the same relationship to the animal population as the chief health officer does to the human, and he must be in a position to advise the Government of the steps to be taken to prevent the introduction of disease, and to control the same if it should break out.

Before this can be done, however, he must possess a knowledge of the diseases of other States and countries, their period of incubation, mode of spread, &c., and there must be some form of reciprocity of information. The introduction of animals from places outside Australia is controlled by the Quarantine Act, and animals and animal products are admitted from certain parts of the world only, and then only under certain precautions based on a knowledge of the particular diseases of these countries. To the veterinary control exercised under this

Act Australia owes its freedom from many serious stock diseases which occur in other parts of the world.

In the same way, the interchange of animals between the different Australian States is determined by the diseases present and the way they are controlled. Amongst veterinarians the controlling and administrative services are recognised as of first importance.

However, in order that these branches may work effectively research and investigation are necessary, as it is impossible to make satisfactory recommendations for regulating the movements of animals or controlling disease until all aspects have been studied. Methods of control depend on a correct diagnosis and a knowledge of what may be termed the life history of any particular disease or parasite. It is here that the investigator and bacteriologist play their part, which is becoming of increasing importance in Australia, as new diseases are constantly appearing. Investigation is continually bringing to light new methods of prevention and treatment of disease, and these must be applied to ensure the maximum protection against losses in livestock. One of the most outstanding examples of the applications of new knowledge is the discovery by Dr. Turner of a successful vaccine against "black disease," whereby in a number of the Australian States thousands of sheep have been protected against a disease which is invariably fatal.

A distinction must be made between the work of a Government veterinary officer and one in private practice. The former is concerned, not with private cases, but with those of economic importance to the country as a whole—infectious and contagious diseases, parasitic infestations, and diseases of animals which affect the public health. A very great responsibility rests upon the veterinarian in connection with these different conditions, and no standardised or rule-of-thumb methods are efficacious. In order to ensure the best results a knowledge of the local conditions is essential.

All veterinarians will endorse the report of the Committee on Parasitic Diseases of the United States Live Stock Sanitary Association, which states:

> "The treatment of parasitic diseases should be regarded as the field of the veterinarian rather than that of the stockman, for only the veterinarian is qualified to make a diagnosis and prescribe the most efficacious treatment. The veterinarian is there to advise the farmer. Advice should only be offered after the farm has been visited and after the veterinarian has satisfied himself as to the cause of the trouble. Farmers cannot be satisfactorily advised on the treatment of their stock by an expert living hundreds of miles away and unacquainted with local conditions. In our advice to farmers on various subjects we often lose sight of the fact that our country is a large one and that the same malady may be influenced by different factors in different parts."

There is a tendency on the part of stockowners to ascribe the cause of disease to what is most obvious to them, whereas a veterinary investigation will often reveal quite a different cause, or a number of factors contributing to the disease.

If used unskillfully, certain vaccines and similar preparations are liable to result in the spread of disease. They should be used only under the direction of a trained veterinarian who is conversant with their properties. While the technique of vaccination is simple, the ability to know when and under what conditions the use of vaccine is advisable is confined to those whose specialised knowledge fits them for the work. Some vaccines are quite devoid of risk, while others, depending on the circumstances, are dangerous or useless. Consequently many countries prescribe conditions under which they may be used.

The diseases of dairy stock demand the constant attention of the veterinary officer. Contagious abortion, mammitis, tuberculosis, and various diseases in calves all require investigation and advice concerning prevention and treatment. This advice differs according to the conditions found. Only rarely is one confronted with exactly the same set of circumstances twice.

Deficiency diseases take a heavy toll of Australian livestock, but through veterinary research nutritional problems are being rapidly solved. Notable work has already been done on the treatment and prevention of diseases due to deficiency of phosphorus and iron.

All countries which possess a veterinary service have certain diseases scheduled, and there is an obligation on the part of the stockowner to report the known or suspected existence of them. When this is done the control is handed over to veterinary officers, and the requisite steps are taken for the suppression of outbreaks. In order that stockowners may be able to suspect the existence of certain dangerous diseases, all countries publish popular articles for their information.

Space will not permit details of all veterinary activities, but, on the other hand, this article would fall short if it did not stress the duty of the stockowner to the State and the veterinary officer. The single case of to-day may be the epidemic of to-morrow. In so far as the veterinary officers receive the co-operation and assistance of the stockowner, so is their work effectively performed, and the reporting of deaths of stock is a duty which the stockowner owes both to himself and to his neighbours.

The fact that "no man liveth unto himself" is borne out in the lives of the stockowner and the orchardist. As he is careful about the investigation and control of diseases and pests, so he benefits his neighbours and the whole country, whereas by carelessness and indifference he may involve his neighbours and himself in severe loss.

PURE-BRED HERD RECORDING, SEASON 1930-31.

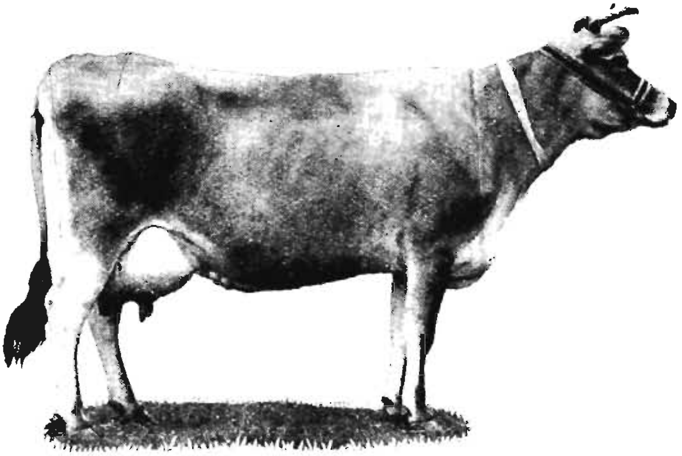
Notes on the Year's Testing.

DURING the year 221 cows, contained in 32 herds, completed their tests. The average production (butterfat) of cows of all breeds and ages was 337·6 lb., an increase of 19·4 lb. of butterfat on the previous year, or an increase of 64·6 lb. per cow since 1920. The following table shows the number of cattle tested and the average butterfat production since 1919-20:—

Year.	No of Cows.	Average Butterfat Production.	Year.	No. of Cows	Average Butterfat Production.
		lb.			lb.
1919-20....	49	273·0	1927-28....	166	317·6
1923-24....	153	318·0	1928-29....	234	299·3
1924-25....	177	327·0	1929-30....	271*	318·2
1925-26....	139	324·0	1930-31....	221	337·6
1926-27....	99	339·2			

* Does not include Mr. MacKenzie's herd (14 cows).

The average production of heifers was 290·4 lb., an increase of 4·3 lb. over the previous year, or an increase of 81·4 lb. during the past 11 years.



A new Tasmanian record (butterfat) for cows of all breeds and ages has been established by Mr. Geo. Richardson's "Rosevale Inka Sylvia Flora" (2884); commencing her test at the age of five years, she produced in 273 days 20,599 lb. of milk and 859·7 lb. of butterfat, with an average test of 4·17 per cent. The previous record was held by Mr. W. T. Harding's "Hillstead Bluebell 2nd" (Milk, 14,405 lb.; butterfat, 851·5 lb.; average test 5·91 per cent.). "Rosevale Inka Sylvia Flora" (2884), continuing her test for 365 days, yielded: Milk, 25,790 lb.; butterfat, 1064·3 lb.—the record for which is still held by "Hillstead Bluebell 2nd" (viz., 1125 lb. butterfat).

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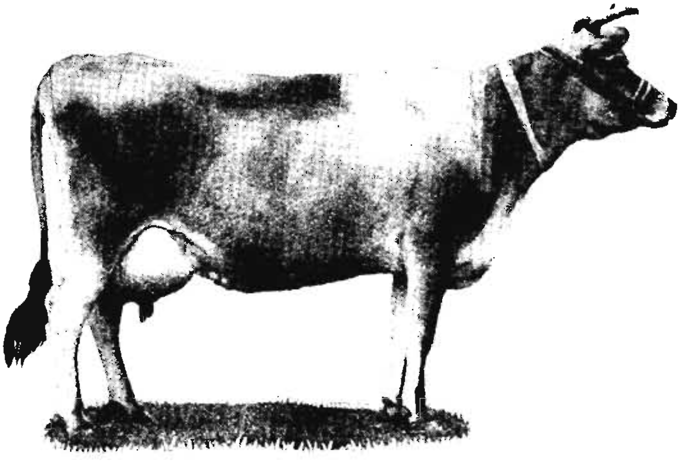

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HERD SUMMARY.

No. and Herd Owner.	Breed.*	Average Milk Per Cow.	Test.	Average Butterfat Per Cow.	M	4	3	2	Total.
1. Richardson, Geo.	F	16,159	3.63	587.2	5	7	...	1	13
2. Hay, C. J.	F	14,945	3.24	484.5	1	...	2	1	4
3. Hay, Willis	F	12,190	3.43	418.7	2	.	1	3	6
4. Relbia Farm and Dairy Pty. Ltd.	J	7,934	5.13	407.4	1	...	....	1	2
5. Cannon, S. L.	J	7,410	5.28	391.7	3	1	4	6	14
6. Proctor, C. A.	J	7,311	5.14	376.0	3	....	3	3	9
7. Gardner, H. R., & Sons	MS	9,003	4.15	374.0	1	....	..	.	1
8. Johnson, J. F.	J	7,045	5.18	365.3	.	1	....	1	2
9. Harding, W. T.	J	6,603	5.39	356.5	6	1	3	1	11
10. Mackenzie, R. G.	MS	8,198	4.29	351.9	6	....	. .	..	6
11. Champion, A. . . .	J	6,121	5.70	349.0	6	3	1	2	12
12. Mervyn Brae Jersey Herd	J	6,350	5.48	348.5	..	...	1	2	3
13. Griffin, J. V.	J	6,801	5.10	346.9	3	..	.	3	6
14. Cowie, A. E.	J	6,494	5.26	342.1	4	1	4	4	13
15. Bramich, M. L.	J	5,992	5.64	338.2	...	1	. .	3	4
16. French, P. W. . ..	J	5,814	5.54	322.5	....	.	1	.	1
17. Williams, M. H.	J	5,655	5.61	317.7	3	1	..	....	4
18. Ashley Home . ..	A	6,400	4.90	313.6	1	1	.	....	2
19. Briggs, H. H., & Sons	J	5,707	5.32	303.9	5	1	1	2	9
20. Blundstone, J. E.	RP	7,486	4.00	303.1	6	6		1	13
21. Sadler, B. T.	J	5,301	5.70	302.2	. .	.	3	11	14
22. Wing, G. H.	A	7,149	4.19	299.9	2	1	2	1	6
23. Blakeney, C. A.	J	4,641	6.32	293.6	..	.	....	1	1
24. Trethewie, R. J.	MS	6,777	4.28	290.4	1	1	....	1	3
25. Mackey, J. H.	J	5,090	5.66	288.1	....	.. .	...	1	1
26. Robotham, H. V.	F	7,631	3.67	280.7	.	..	.	2	2
27. Heyes, W. C.	J	5,116	5.46	279.6	2	.. .	2	4	8
28. Steel, L. J.	MS	6,889	4.02	277.2	4	3	2	3	12
29. Gladman Bros.	RP	5,493	4.85	266.5	..	1	2	...	2
30. Mackay, H. S.	MS	6,553	4.03	264.1	9	3	2	1	15
31. Thompson, J. H.	RP	6,531	4.03	263.5	7	. .	1	9	17
32. Von Stieglitz, H.	MS	5,039	4.23	213.6	3	...	1	. .	4
					84	33	36	68	221

*A. Ayrshire. J. Jersey. F. Friesian. M.S. Milking Shorthorn. R.P. Red Poll.

LIST OF LEADING COWS IN EACH CLASS.

Class.	Name of Cow.	Herd Book Number.	Owner.	Milk.	Average Test.	Butterfat.
Mature	Rosevale Inka Sylvia Flora	2,884	Richardson, Geo.	20,599	4.17	859.7
Senior 4	Rosevale Lady Colantha Posch	2,887	Richardson, Geo.	19,875	3.74	744.7
Junior 4	Rosevale Verbelle Pietertje Posch	2,890	Richardson, Geo.	12,884	3.82	469.3
Senior 3	Relbia Bluebell	21,033	Cannon S. L.	8,599	5.75	494.9
Junior 3	Winlaton Catriona Alcartra	3,276	Hay, C. J.	15,628	3.51	550.0
Senior 2	Levengrove Nanette 2nd	24,879	Cannon, S. L.	7,737	5.73	443.6
Junior 2	Martigny Flora Echo	NYA	Richardson, Geo.	13,197	3.85	509.1

LIST OF COWS IN ORDER OF MERIT.

Mature Cows.

Standard: 350 *lb. Butterfat.*

No. and Name of Cow.	Breed.*	Herd Book Number.	Owner.	Age.	Date of Calving.	Milk. lb.	Test Per Cent.	Butterfat lb.
1. Rosevale Inka Sylvia Flora	F	2,884	Richardson, G.	5.0	2.1.30	20,599	4.17	859.7
2. Rosevale Korndyke Lassie	F	2,886	Richardson, G.	5.3	29.1.30	19,956	3.40	679.3
3. Rosevale Alta Posch	F	2,878	Richardson, G.	5.2	20.11.29	17,592	3.81	670.7
4. Rosevale Doreen Sylvia	F	2,882	Richardson, G.	6.7	26.7.30	18,281	3.27	599.3
5. Relbia Ettie	J	15,732	Cannon, S. L.	6.11	1.7.30	11,369	5.09	578.9
6. Hillstead Pretty Maid	J	12,767	Harding, W. T.	7.6	1.5.30	10,289	5.58	574.1
7. Burnbank Molly Triumph	F	2,130	Hay, C. J.	6.11	20.10.29	18,243	2.89	528.4
8. Relbia Jonquil	J	15,741	Cannon, S. L.	6.4	7.11.29	9,594	5.35	513.7
9. Allan Water Vesta 3rd	J	14,690	Champion, A.	8.0	27.8.30	7,944	6.36	505.9
10. Rosevale Pieterje Colantha Posch	F	3,208	Richardson, G.	5.1	14.4.30	13,584	3.52	478.4
11. Magician's Elf of Kameruka	J	12,117	Proctor, C. A.	8.2	25.5.30	8,966	5.20	466.7
12. Clifton Daffodil	J	19,160	Griffin, J. V.	6.2	30.8.30	10,366	4.48	464.4
13. Kellevie Primrose	F	..	Hay, Willis	5.5	7.4.30	13,366	3.41	457.1
14. Palmerston Maid	J	16,874	Proctor, C. A.	6.3	30.3.30	8,753	5.13	449.4
15. Kellevie Queen	F	...	Hay, Willis	5.8	11.10.29	13,780	3.18	438.6
16. Relbia Dolly	J	15,728	Relbia Farm and Dairy Pty.	5.7	7.10.29	7,608	5.54	421.5
17. Palmerston Daphne 2nd	J	21,025	Proctor, C. A.	6.2	16.6.30	8,210	5.10	419.1
18. Allan Water Alannah	J	20,929	Champion, A.	5.11	10.9.30	6,829	5.95	406.5
19. Hillstead Elsie	J	12,762	Harding, W. T.	7.6	2.3.30	8,097	4.96	401.8
20. Mariposa's Mist Wreath of Kameruka	J	12,806	Briggs, H., & Sons	8.3	1.9.30	7,458	5.30	395.6
21. Daphne 2nd of Pelerine	MS	17,784	Mackay, H. S.	6.11	4.8.30	9,634	4.07	392.4
22. Clifton Bluebell	J	20,966	Griffin, J. V.	5.0	29.8.30	8,109	4.81	390.6
23. Hillstead Fancy	J	12,759	Cannon, S. L.	8.8	9.6.30	7,388	5.27	390.0
24. Nallinga Topnotch	RP	1,622A	Blundstone, J. E.	5.11	15.6.30	8,394	4.60	386.3
25. *Victoria Battleflight*	RP	1,147A	Thompson, J. H.	7.1	17.7.30	9,186	4.19	385.4
26. Rose 4th of Pelerine	MS	18,594	Mackay, H. S.	6.7	6.6.30	7,918	4.85	384.1
27. Moola Pansy	A	20,545	Wing, G. H.	7.11	22.9.30	9,141	4.18	382.5
28. Maggie 2nd of Fairhill	MS	18,599	MacKenzie, R. G.	8.11	21.8.30	8,757	4.36	382.5
29. Allan Water Felicity	J	20,935	Champion, A.	6.0	22.9.30	6,719	5.66	380.6
30. Valmont Mirrie	J	16,888	Heyes, W. C.	5.6	20.10.29	6,376	5.95	379.5
31. Hillstead Buttercup	J	12,760	Harding, W. T.	7.5	6.6.30	7,171	5.26	377.7
32. Newington Rose 8th	MS	NYA	Gardner & Son	9.0	20.8.30	9,003	4.15	374.2
33. Flowing Vale Starette 2nd	RP	1,720B	Thompson, J. H.	7.10	2.7.30	9,398	3.96	373.0
34. Hillstead Joyful	J	20,981	Harding, W. T.	5.1	1.8.30	7,399	5.03	372.6
35. Hillstead Dot	J	23,744	Griffin, J. V.	5.6	28.5.30	6,519	5.70	371.8
36. Palmerston Lady	J	18,570	Cowie, A. E.	5.10	19.9.30	7,601	4.87	370.3
37. Palmerston Fairy	J	11,131	Cowie, A. E.	9.11	20.8.30	7,208	5.03	363.0
38. Primrose of Fairhill	MS	18,603	MacKenzie, R. G.	9.8	3.9.30	8,596	4.18	360.1
39. Gem of Fairhill	MS	18,596	MacKenzie, R. G.	11.8	8.9.30	8,537	4.18	357.4
40. Hillstead Precious	J	15,716	Williams, M. H.	6.8	4.8.30	6,669	5.36	357.4
41. Royal Pet of Taraganda	J	12,809	Cowie, A. E.	8.1	1.4.30	7,476	4.76	356.2
42. Allan Water Venus	J	20,944	Champion, A.	5.4	19.9.30	6,350	5.60	356.1
43. Pearl 4th of Fairhill	MS	18,601	MacKenzie, R. G.	8.11	16.8.30	8,139	4.36	355.0
44. Pansy 6th of Newington Park	MS	18,592	Mackay, H. S.	8.10	30.8.30	9,249	3.75	345.7
45. Easy of Enstone, Vol. 8	MS	Foundation	Steel, L. J.	8.10	8.8.30	8,119	4.23	344.2
46. Myrtle of Fairhill	MS	18,600	MacKenzie, R. G.	7.9	15.8.30	7,977	4.28	341.7
47. Hillstead Roseleaf	J	12,770	Harding, W. T.	7.9	28.7.30	6,250	5.46	341.7
48. Allan Water Geraldine	J	12,754	Champion, A.	8.8	31.8.30	7,093	4.77	339.0
49. Enstone Arabell	MS	NYA	Steel, L. J.	6.10	1.8.30	9,015	3.75	338.7
50. Dolly of Pelerine	MS	13,444	Mackay, H. S.	8.0	1.9.30	8,945	3.77	337.4
51. Hillstead Eclipse	J	15,713	Williams, M. H.	6.6	27.6.30	5,611	5.95	334.1
52. Palmerston Folly	J	20,920	Briggs, H., & Sons	5.1	13.8.30	6,096	5.47	333.4
53. Newnham Ruac	J	12,122	Briggs, H., & Sons	7.9	24.8.30	6,856	4.78	328.1
54. Hillstead Fairy Bell	J	20,978	Williams, M. H.	5.11	28.7.30	5,874	5.52	324.1
55. Mill Farm Harriett	MS	13,770	Trethewie, R. J.	7.3	9.1.30	7,935	4.07	323.3
56. Hillstead Duchess	J	12,761	Harding, W. T.	8.9	22.7.30	6,655	4.80	319.4
57. Victoria Tulip	RP	798B	Blundstone, J. E.	8.10	4.7.30	7,869	4.0	315.2
58. Heather 2nd of Newington Park	MS	18,597	MacKenzie, R. G.	11.11	29.8.30	7,183	4.38	315.1
59. Muse 3rd of Taraganda	J	13,159	Cowie, A. E.	7.10	3.7.30	6,822	4.56	311.2
60. Allan Water Mascot	J	20,938	Champion, A.	5.10	18.9.30	5,676	5.42	307.8
61. Nalinga Adrina 2nd	RP	..	Blundstone, J. E.	5.7	30.6.30	7,881	3.89	307.1
62. Dot of Enstone, Vol. 8	MS	Foundation	Steel, L. J.	6.10	7.8.30	8,415	3.58	301.8
63. Dolly 3rd of Newington Park	MS	13,448	Mackay, H. S.	8.11	29.8.30	7,590	3.92	297.9

* A. Ayrshire. J. Jersey. F. Friesian. M.S. Milking Shorthorn. R.P. Red Poll

MATURE COWS—*continued.*

No. and Name of Cow.	Breed.*	Herd Book Number.	Owner.	Age.	Date of Calving.	Milk. lb.	Test Per Cent.	Butterfat lb.
64. Daphne of Pelerine	MS	13,415	Mackay, H. S.	8.0	17.9.30	7,088	4.18	296.4
65. Pansy of Pelerine	MS	17,792	Mackay, H. S.	6.11	18.8.30	7,329	4.03	295.9
66. Flowing Vale Penny Belle	RP	1,717B	Blundstone, J. E.	5.0	27.8.30	7,437	3.94	293.1
67. Rose of Pelerine	MS	17,794	Mackay, H. S.	8.11	1.10.30	7,415	3.89	288.7
68. Lotus of Moola	A	14,315	Ashley Home	5.3	25.1.30	5,534	5.20	288.1
69. Music of Brookhill	A	10,112	Wing, G. H.	8.1	20.10.29	6,999	4.06	284.4
70. Flowing Vale Ringum	RP	1,790C	Thompson, J. H.	8.11	18.11.29	7,309	3.86	282.4
71. Mabel 6th of Newington Park	MS	14,027	Mackay, H. S.	8.10	1.9.30	7,403	3.71	274.9
72. Wyndham Lady	J	16,896	Briggs, H., & Sons	8.4	10.9.30	5.384	5.06	272.8
73. Queen Regnant	RP	1,285C	Thompson, J. H.	6.3	4.11.29	6.929	3.88	269.3
74. Rose of Newington Park†	MS	NYA	Von Steiglitz, H.	9.10	16.7.30	6,494	4.10	266.3
75. Relbia Sophie	J	12,141	Heyes, W. C.	8.3	22.9.30	5.226	4.99	260.9
76. Naiinga Butterfly	RP	1,706B	Blundstone, J. E.	5.0	13.8.30	6.105	4.21	257.2
77. Sophia 2nd of Enstone	MS	17,844	Steel, L. J.	5.0	28.8.30	6,644	3.85	256.2
78. Victoria Mapleleaf	RP	719A	Thompson, J. H.	8.9	7.11.29	7,458	3.41	254.9
79. Victoria Florin	RP	717A	Thompson, J. H.	7.7	4.11.29	6.993	3.61	252.8
80. Victoria Titania	RP	724A	Blundstone, J. E.	8.11	14.8.30	6,003	3.92	235.7
81. Flowing Vale Dewdrop II.	RP	1,304	Thompson, J. H.	9.1	6.11.29	6,042	3.88	234.5
82. Chief Bread's Silver of Kameruka	J	12,800	Briggs, H., & Sons	8.10	19.8.30	4.539	4.82	219.0
83. Viola of Belgrove	MS	NYA	Von Stieglitz, H.	9.2	25.12.29	5.155	4.15	214.1
84. Daisy 2nd	MS	18,629	Von Stieglitz, H.	5.6	11.4.30	3.778	4.46	168.8

*A. Ayrshire. J. Jersey. F. Friesian. M.S. Milking Shorthorn. R.P. Red Poll.

† Name subject to alteration by Herd Society.

Average for Mature Cows.

Milk: 8368. Test: 4.39 per cent. Butterfat: 367.6 lb.

SENIOR FOUR-YEAR-OLDS.

Standard: 330 lb. Butterfat.

No. and Name of Cow.	Breed.*	Herd Book Number.	Owner.	Age.	Date of Calving.	Milk. lb.	Test. Per Cent.	Butterfat. lb.
1. Rosevale Lady Colantha Posch	F	2,887	Richardson, G.	4.10	4.12.29	19,875	3.74	744.7
2. Rosevale Beauty Sylvia	F	2,879	Richardson, G.	4.10	30.11.29	17,277	3.69	637.7
3. Rosevale Queen Pontiac Inka	F	2,889	Richardson, G.	4.11	10.10.29	14,051	3.71	522.0
4. Rosevale Kathleen Posch	F	2,885	Richardson, G.	4.7	26.10.29	14,550	3.45	503.2
5. Rosevale Model Sylvia Griselda	F	2,888	Richardson, G.	4.8	18.9.30	14,109	3.50	494.0
6. Rosevale Sylvia Catrina Posch	F	3,209	Richardson, G.	4.5	6.2.30	14,721	3.16	466.6
7. Relbia Handsome Meg	J	21,038	Cannon, S. L.	4.8	14.6.30	7,674	5.38	413.5
8. Hillbrow Fairy's Jean	J	21,062	Bramich, M. L.	4.9	20.4.30	6,561	6.18	405.8
9. Flowing Vale Diana	RP	1,781C	Blundstone, J. E.	4.9	1.7.30	8,470	4.31	365.4
10. Enstone Lottie		NYA	Steel, L. J.	4.10	18.8.30	8,702	4.08	355.3
11. Flowing Vale Dodger 3rd	RP	1,783	Blundstone, J. E.	4.10	10.7.30	8,207	4.24	348.0
12. Flowing Vale Merle	RP	1,425AA	Blundstone, J. E.	4.9	30.6.30	8,780	3.87	340.4
13. Moola Myrtle	A	16,494	Ashley Home	4.11	24.9.30	7,267	4.66	339.1
14. Moola Betty	A	16,493	Wing, G. H.	4.10	23.8.30	7,395	4.47	330.6
15. Flowing Vale Winsum	RP	1,796C	Blundstone, J. E.	4.11	3.8.30	8,315	3.85	320.4
16. Zenda of Enstone, Vol. 8	MS	Foundation	Steel, L. J.	4.11	13.8.30	8,532	3.73	318.6
17. Flowing Vale Beauty Spot	RP	1,774C	Blundstone, J. E.	4.11	28.7.30	8,183	3.74	306.3
18. Pride 3rd of Enstone	MS	18,615	Steel, L. J.	4.11	7.8.30	6,121	4.24	259.9
19. Hillstead Duchess 2nd	J	20,977	Williams, M. H.	4.11	15.4.30	4,468	5.70	254.9
20. Allan Water Minerva	J	20,940	Champion, A.	4.11	24.8.30	4,704	5.21	245.3
21. Flowing Vale Goldie	RP	1,424AA	Blundstone, J. E.	4.10	4.8.30	5,862	3.52	206.6
22. Rose 5th of Pelerine	MS	NYA	Mackay, H. S.	4.11	1.10.30	4,122	3.74	154.2

*A. Ayrshire. J. Jersey. F. Friesian. M.S. Milking Shorthorn. R.P. Red Poll.

Average for Senior Four-Year-Olds.

Milk: 9452 lb. Test: 4 per cent. Butterfat: 378·7 lb.

JUNIOR FOUR-YEAR-OLDS.

Standard: 310 lb. Butterfat.

No. and Name of Cow.	Breed.*	Herd Book Number.	Owner.	Age.	Date of Calving.	Milk. lb.	Test. Per Cent	Butterfat lb.
1. Rosevale Verbelle Pieterje Posch	F	2,890	Richardson, G.	4.1	5.11.29	12,284	3.82	469.3
Iillstead Gladsome	J	23,746	Harding, W. T.	4.0	2.9.30	7,117	6.24	444.4
'almerston Hawthorn ..	J	24,726	Cowie, A. E.	4.0	11.8.30	8,189	5.15	421.8
›alford Chevy 5th ...	J	23,576	Johnson, J. F.	4.1	10.6.30	7,664	5.22	400.4
.llan Water Frances .	J	23,723	Champion, A.	4.0	17.10.29	6,190	5.61	347.6
'almerston Bloom	J	20,919	Briggs, H., & Sons	4.9	8.4.30	6,298	5.46	344.1
.llan Water Allanah 2nd	J	23,720	Champion, A.	4.0	14.9.30	5,858	5.50	322.4
till Farm Lily 7th ..	MS	17,814	Trethewie R. J.	4.1	14.11.29	6,941	4.56	316.7
:ose 7th of Pelerine ..	MS	17,798	Mackay, H. S.	4.1	14.9.30	6,465	3.63	234.9
:arong Rose 18th . ..	RP	1,731B	Gladman Bros.	4.2	7.3.30	4,483	5.08	228.1
:ose 6th of Pelerine	MS	17,794	Mackay, H S.	4.1	16.11.29	4,576	4.20	192.5

*A. Ayrshire. J. Jersey. F. Friesian. M.S. Milking Shorthorn. R.P. Red Poll.

Average for Junior Four-Year-Olds.

Milk: 6915 lb. Test: 4·89 per cent. Butterfat: 338·3 lb.

SENIOR THREE-YEAR-OLDS.

Standard: 290 lb. Butterfat.

. and Name of Cow.	Breed.*	Herd Book Number.	Owner.	Age.	Date of Calving.	Milk. lb.	Test. Per Cent.	Butterfat lb.
elbia Bluebell	J	21,033	Cannon, S. L.	3.11	14.10.29	8,599	5.75	494.9
almerston Maid 2nd	J	24,727	Cowie, A. E.	3.9	1.7.30	9,027	5.35	483.7
lifton Joan . .	J	23,741	Cannon, S. L	3.6	8.4.30	7,335	5.33	391.1
ayston Queen ..	F	NYA	Hay, Willis	3.11	3.7.30	11,833	3.20	379.3
llan Water Violet	J	23,731	Champion, A.	3.11	16.8.30	6,036	6.27	378.7
annoch Girl . .	J	23,770	Mervyn Brae Jersey Herd	3.10	10.9.30	6,624	5.67	375.3
almerston Maybloom .	J	24,728	Cowie, A. E.	3.10	10.8.30	6,715	5.45	366.3
oraville Jessie	J	24,731	French, P. W.	3.6	10.8.30	5,814	5.54	322.5
elbia Iris ..	J	23,766	Heyes, W. C.	3.9	3.9.30	4,998	6.41	320.5
len Vina Silvy	J	21,024	Proctor, C. A.	3.9	18.3.30	5,526	5.61	310.3
nole Joyful	J	21,030	Cannon, S. L.	3.11	28.8.30	5,808	5.26	305.5
arong Belle 13th .	RP	2,493C	Gladman Bros.	3.6	7.4.30	6,790	4.31	293.1
ansy 2nd of Pelerine .	MS	17,793	Mackay, H. S.	3.10	1.7.30	5,436	4.41	240.2

*A. Ayrshire. J. Jersey. F. Friesian. M.S. Milking Shorthorn. R.P. Red Poll.

Average for Senior Three-Year-Olds.

Milk: 6964 lb. Test: 5·14 per cent. Butterfat: 358·6 lb.

Junior Three-Year-Olds.

Standard: 270 lb. Butterfat.

No. and Name of Cow.	Breed.*	Herd Book Number.	Owner.	Age.	Date of Calving.	Milk. lb.	Test. Per Cent.	Butterfat lb.
1. Winlaton Catriona Alcarta	F	3,276	Hay, C. J.	3.0	21.10.29	15,628	3.51	550.0
2. Levengrove Nanette 1st	J	23,719	Cannon, S. L.	3.3	11.11.29	8,203	5.46	447.9
3. Winlaton Lady Burkeyje	F	2,969	Hay, C. J.	3.1	11.10.29	14,315	3.08	441.6
4. Palmerston Charity	J	25,105	Cowie, A. E.	3.2	20.9.30	7,273	5.68	413.7
5. Rannoch Linda's Lady 2nd	J	25,184	Sadler, B. T.	3.1	14.9.30	6,657	5.93	395.3
6. Knole Firefly	J	25,164	Proctor, C. A.	3.2	19.6.30	7,584	5.06	383.8
7. Rannoch Valmaid	J	21,052	Sadler, B. T.	3.4	23.11.29	5,926	6.23	369.2
8. Rannoch Vallello	J	25,194	Sadler, B. T.	3.0	17.9.30	6,210	5.80	360.2
9. Glen Vine Daphne 2nd	J	25,160	Proctor, C. A.	3.1	18.5.30	6,946	4.98	346.2
10. Hillstead Silver Queen	J	23,750	Harding, W. T.	3.2	28.10.29	5,693	5.66	322.7
11. Palmerstone Hawthorn 2nd	J	25,106	Cowie, A. E.	3.1	24.9.30	5,076	6.14	311.8
12. Moola Primrose	A	23,132	Wing, G. H.	3.0	17.9.30	6,896	4.45	307.2
13. Hillstead Jewell	J	25,129	Harding, W. T.	3.4	4.9.30	4,947	5,85	289.6
14. Valmont Royal Pet	J	24,721	Briggs, H., & Son	3.1	14.4.30	4,844	5.97	289.3
15. Karong Maid 3rd	RP	2,585D	Gladman Bros.	3.3	7.1.30	5,207	5.34	278.3
16. Moola Violet	A	16,495	Wing, G. H.	3.2	13.10.29	7,128	3.86	275.4
17. Hillstead Gladsome	J	23,746	Harding, W. T.	3.1	30.9.29	4,722	5.69	269.1
18. Cherry 2nd of Enstone	MS	18,606	Steel, L. J.	3.1	26.8.30	6,162	4.32	266.3
19. Rose of Enstone, Vol. 8	MS	Foundation	Steel, L. J.	3.2	2.10.29	5,561	4.45	247 6
20. Knole Margery	J	21,031	Heyes, W. C.	3.3	11.1.30	4,587	5.28	242.3
21. Daisy 3rd	MS	18,630	Von Stieglitz, H.	3.1	6.11.29	4,730	4.33	205.2
22. Wingaroo Ma	RP	2,094AA	Thompson, J. H.	3.0	30.8.30	4,684	3.89	182.3
23. Marjory 2nd of Pelerine	MS	17,791	Mackay, H. S.	3.1	15.12.30	1,786	4.58	81.9

*A. Ayrshire. J. Jersey. F. Friesian. M.S. Milking Shorthorn. R.P. Red Poll.

Average for Junior Three-Year-Olds.

Milk: 6555 lb. Test: 4·82 per cent. Butterfat: 316·3 lb.

Senior Two-Year-Olds.

Standard: 250 lb. Butterfat.

No. and Name of Cow.	Breed.*	Herd Book Number.	Owner.	Age.	Date of Calving.	Milk. lb.	Test. Per Cent.	Butterfat lb.
1. Levengrove Nanette 2nd	J	24,879	Cannon, S. L.	2.6	29.1.30	7,737	5.73	443.6
2. Rannoch Belle	J	25,182	Sadler, B. T.	2.10	12.8.30	7,089	5.70	404.6
3. Relbia Meg's Choice	J	23,767	Mervyn Brae Jersey Stud	2.11	13.10.29	7,133	5.59	399.3
4. Relbia Betsy		NYA	Heyes, W. C.	2.10	1.8.30	6,525	5.56	363.4
5. Hillbrow Poppy	J	23,786	Bramich, M. L.	2.8	23.5.30	6,811	5.27	359.1
6. Glen Vina Fairy	J	25,161	Proctor, C. A.	2.9	13.5.30	5,975	5.35	319.6
7. Hillbrow Maida	J	23,785	Bramich, M. L.	2.8	10.4.30	5,199	6.12	318.7
8. Palmerston Mary	J	25,107	Cowie, A. E.	2.6	31.3.30	5,873	5.40	317.5
9. Rannoch Vallerie	J	25,196	Sadler, B. T.	2.10	9.7.30	5,085	5.74	292.2
10. Rannoch Silver Daisy 2nd	J	25,186	Sadler, B. T.	2.11	31.7.30	5,256	5.55	291.8
11. Wingaroo Label	RP	2,354A	Thompson, J. H.	2.8	21.6.30	6,589	4.26	280.9
12. Clifton Betty 2nd	J	25,115	Griffin, J. V.	2.7	19.4.30	4,794	5.52	264.9
13. Rannoch Silver Pride 3rd	J	25,189	Sadler, B. T.	2.10	22.8.30	5,271	4.84	255.2
14. Wingaroo Zaarana	RP	2,359A	Thompson, J. H.	2.6	1.9.30	5,814	4.35	252.9
15. Rannoch Silvermaid 2nd	J	25,188	Sadler, B. T.	2.10	28.5.30	4,285	5.60	240.2
16. Victoria Silver Bell	RP	2,092AA	Thompson, J. H.	2.7	9.7.30	5,264	4.40	232.0
17. Enstone Minnie 2nd	MS	NYA	Steel, L. J.	2.11	1.9.30	5,940	3.83	227.9
18. Enstone Violet 2nd	MS	NYA	Steel, L. J.	2.10	8.7.30	5,110	4.10	209.9
19. Victoria Chenille	RP	2,310A	Thompson, J. H.	2.9	2.8.30	5,205	3.97	206.6
20. Enstone Daisy 5th	MS	NYA	Steel, J. H.	2.9	7.7.30	4,358	4.59	200.3
21. Wingaroo Zeabelana	RP	NYA	Thompson, J. H.	2.7	6.9.30	4,359	4.21	183.5
22. Dolly 4th of Pelerine	MS	17,787	Mackay, H. S.	2.10	30.8.30	3,353	4.31	144.7

*A. Ayrshire. J. Jersey. F. Friesian. M.S. Milking Shorthorn. R.P. Red Poll.

Average for Senior Two-Year-Olds.

Milk: 5592 lb. Test: 5·04 per cent. Butterfat: 282·1 lb.

JUNIOR TWO-YEAR-OLDS.

Standard: 230 *lb. Butterfat.*

and Name of Cow.	Breed.*	Herd Book Number.	Owner.	Age.	Date of Calving.	Milk. lb.	Test. Per Cent	Butterfat lb.
artigny Flora Echo	F	NYA	Richardson, G.	2.4	8.1.30	13,197	3.85	509.1
urnbank Buttercup Alcartra	F	NYA	Hay, Willis	2.3	20.12.29	13,657	3.65	499.4
oad's End Maida	F	NYA	Hay, C. J.	2.5	13.1.30	11,594	3.60	418.0
elbia Stella	J	25,174	Relbia Farm and Dairy Pty.	2.2	9.10.29	8,261	4.76	393.4
ayston Ramona	F	NYA	Hay, Willis	2.0	5.2.30	11,366	3.40	387.5
urnbank Buttergirl Alcartra	F	NYA	Hay, Willis	2.3	28.11.28	9,140	3.83	350.4
len Vina Maid	J	25,162	Proctor, C. A.	1.11	30.3.30	7,278	4.74	345.1
len Vina Queenie	J	25,163	Proctor, C. A.	2.5	20.9.30	6,569	5.23	344.1
alford Chevy 6th	J	23,577	Johnson, J. F.	2.3	28.9.29	6,427	5.13	330.2
urnbank Queen Marchioness	F	NYA	Robotham, H. V.	1.8	8.2.30	8,819	3.71	327.6
llan Water Dolly 4th	J	25,096	Champion, A.	2.0	27.9.29	5,072	6.39	324.3
annoch Silver Dame 2nd	J	25,187	Sadler, B. T.	2.2	24.7.30	5,559	5.80	322.9
Levengrove Mons Meg	J	25,091	Cannon, S. L.	2.0	4.10.29	6,694	4.78	320.6
Clifton Lady 2nd	J	25,120	Griffin, J. V.	2.5	15.4.30	5,856	5.41	317.0
Levengrove Violet	J	28,256	Cannon, S. L.	1.11	20.7.30	5,656	5.51	311.7
Melton Vale Floss' Beauty	J	25,138	Cowie, A. E.	2.1	31.7.30	5,104	5.93	303.1
Levengrove Tip Top	J	28,255	Cannon, S. L.	2.0	28.7.30	5,835	5.17	301.9
Wingaroo Queen	RP	2,446B	Thompson, J. H.	2.5	11.6.30	6,623	4.54	300.9
Rannoch Belinda	J	25,181	Sadler, B. T.	1.9	21.6.30	5,376	5.58	300.3
Scottsdale Dawn	J	NYA	Briggs, H. H., & Sons	1.5	7.3.30	4,806	6.23	299.5
Wingaroo Kaaba	RP	2,443B	Thompson, J. H.	2.5	12.6.30	7,491	3.99	299.5
Sandown Rosabel	J	NYA	Blakeney, C. A.	1.10	19.5.30	4,641	6.32	293.6
Wingaroo Dable	RP	2,440B	Thompson, J. H.	2.3	8.6.30	6,425	4.53	291.4
Levengrove Military Meg	J	28,253	Cannon, S. L.	1.11	14.7.30	5,575	5.18	289.1
Mill Farm Ranee 17th	J	25,158	Mackay, J. H.	2.0	25.11.29	5,090	5.66	288.1
Hillcrescent Faith	J	28,248	Cannon, S. L.	2.2	28.9.29	6,276	4.50	282.5
Rannoch Starlight Valmaid	J	25,192	Sadler, B. T.	2.0	3.8.30	4,684	5.98	280.4
Rannoch Linda 2nd	J	25,183	Sadler, B. T.	1.11	21.7.30	5,190	5.32	277.3
Allan Water Hetty	J	25,098	Champion, A.	2.0	28.9.29	4,983	5.49	273.8
Clifton Bluebell 2nd	J	25,116	Griffin, J. V.	2.4	14.4.30	5,162	5.28	272.9
Mervyn Brae Beauty	J	25,111	Mervyn Brae Jersey Herd	1.11	24.7.30	5,293	5.10	270.4
Raywood Lily	J	24,875	Bramich, M. L.	2.0	21.5.30	5,400	4.98	268.9
Relbia Elsie	J	NYA	Heyes, W. C.	2.0	23.7.30	5,415	4.83	261.8
Nalinga Dodger	RP	NYA	Blundstone, J. E.	2.4	10.4.30	5,815	4.46	259.8
Valmont's Farewell	J	25,086	Briggs, H. H., & Sons	1.11	17.4.30	5,084	4.98	253.6
Palmerston Rose	J	25,109	Cowie, A. E.	2.1	1.10.29	4,861	5.02	244.4
Burnbank Queen Fobes	F	NYA	Robotham, H. V.	1.8	8.2.30	6,443	3.63	233.9
Mill Farm Lily 13th	MS	17,818	Trethewie, R. J.	2.1	14.12.29	5,455	4.24	231.3
Rannoch Valrose 2nd	J	25,198	Sadler, B. T.	1.10	5.4.30	3,917	5.84	229.0
0. Moola Lottie	A	20,542	Wing, G. H.	1.11	26.10.29	5,337	4.11	219.7
1. Rannoch Starlight Valinda	J	25,190	Sadler, B. T.	1.10	23.4.30	3,721	5.72	213.0
2. Relbia Doris	J	NYA	Heyes, W. C.	2.2	20.12.29	4,508	4.65	210.0
3. Hillstead Satisfaction	J	NYA	Harding, W. T.	2 1	4.10.30	4,302	4.85	208.8
4. Relbia Millie 2nd	J	NYA	Heyes, W. C.	1.10	20.8.30	3,296	6.04	199.2
5. Victoria Velregal	RP	2,093	Thompson, J. H.	2.4	16.8.30	5,261	3.77	198.9
6. Palmerston Silvy 5th	J	25,110	Cowie, A. E.	2.2	4.10.29	3,197	5.79	185.3

*A Ayrshire. J. Jersey. F. Friesian. M.S. Milking Shorthorn. R.P. Red Poll.

Average for Junior Two-Year-Olds.

Milk: 6211 lb. Test: 4·73 per cent. Butterfat: 294·4 lb

EXTENDED TESTS (365 DAYS).

MATURE COWS.

No. and Name of Cow.	Breed.*	Herd Book Number.	Owner.	Age.	Date of Calving.	Milk. lb.	Test. Per Cent.	Butterfat. lb.
1. Rosevale Inka Sylvia Flora	F	2,884	Richardson, G.	5.0	2.1.30	25,790	4.12	1064.3
2. Rosevale Korndyke Lassie	F	2,886	Richardson, G.	5.3	29.1.30	22,927	3.50	804.7
3. Burnbank Molly Triumph	F	2,130	Hay, C. J.	6.11	20.10.29	23,068	2.98	688.3
4. Kellevie Empress de Kol	F		Hay, Willis	5.8	3.9.29	19,644	3.07	603.4
5. Kellevie Queen	F	....	Hay, Willis	5.8	11.10.29	16,818	3.30	555.1
JUNIOR THREE-YEAR-OLDS.								
1. Winlaton Catriona Alcartra	F	3,276	Hay, C. J.	3.0	21.10.29	19,492	3.54	688.4
JUNIOR TWO-YEAR-OLDS.								
1. Martigny Flora Echo ..	F	....	Richardson, G.	2.4	8.1.30	16,063	3.90	627.3
2. Martigny Queen Pontiac	F	....	Richardson, G.	1.11	31.7.29	14,635	3.66	536.4

*A. Ayrshire. J. Jersey. F. Friesian. M.S. Milking Shorthorn. R.P. Red Poll.

WILD WHITE CLOVER.

Wild White is a superior variety of white clover which differs from the ordinary type (White Dutch) by having the property of throwing out long runners, which take root where they come into contact with the ground. This enables the plant to spread rapidly and fill up bare spaces in a pasture.

Two strains are procurable at the present time. Kentish has the spreading habit developed to the greater degree, but the seed is costly. New Zealand Wild White is somewhat inferior in respect to runner development, but the seed is considerably cheaper than the Kentish. It is much to be preferred to the ordinary upright-growing White Dutch.

ANSWERS TO ENQUIRIES.

Question.—Do pig lice do much harm? If so, how can they be controlled?

Answer.—The pig louse *(Hæmatopinus suis)* is a blood-sucking louse and one of the largest known.

It does harm by sucking blood, and also by causing irritation of the skin, which results in animals becoming restless, so that they will neither feed nor rest properly.

Treatment should be on the following lines:—All litter in the sties should be burned. The sites should then be sprayed with sheep-dip or phenyle, and the pigs should be dressed with one of the following:

(1) Jeyes Fluid, 1 in 60 of water, previously dissolving about ¼-lb. soft soap in each gallon of water.

(2) Kerosene, 1 pint; soft soap, 1 lb.; water, 1 gallon.

Provide a rubbing post for the pigs. Sink a round post in the sty, place three or four folds of bagging round this, and keep the bagging soaked with waste oil to which has been added 1 part of creolin to every 100 parts of oil.

—*Veterinary Division.*

method of obtaining properly coloured fruit, which is such an important factor in determining quality.

A further consideration is the elimination, before the time of harvesting, of defective apples or pears. Even in those orchards which receive the very best attention in the way of spraying, there is always a percentage of fruit injured by insect and fungus parasites to such an extent that it is unsaleable. A well-sprayed apple or pear is effectively protected, but where they are clustered together they cannot be well sprayed, more especially in the later stages. How very common it is to find a whole cluster of fruit destroyed by codlin moth caterpillars simply because it was so crowded that proper spraying was impossible. When thinning is done, fruits will not be left so closely together that they cannot be covered with spray material. Over and above this, all the seriously blemished fruit that is on the tree at the time of thinning can easily be removed. If the year has been a bad one for black spot or codlin moth, the apples or pears which have been severely attacked should all be picked off. In this way a lot of extra sorting in the packing-shed can be avoided. The tree is not only relieved from the strain of maturing useless fruit, but if all grub-infested apples found during thinning are destroyed it will materially assist in codlin moth control. It is true that moth infestation goes on after the season for thinning is over, but, as already suggested, a properly thinned crop is an easy one to spray, and one good cover spray after the completion of thinning is worth several sprayings when the fruit is growing in clusters.

Apart from the fruit, thinning has beneficial effects on the tree. If a lot of culls, which at harvest time are discarded as unsaleable, have to be brought to maturity, it is only reasonable to suppose that some of the vitality of the tree has been wasted. In this way the future cropping capabilities of an orchard may be impaired, more particularly if it is a young one.

When trees are overloaded with fruit for a season it often happens that the next crop will be a light one. This allows the tree to recover to some extent from the excessive crop, and also to prepare for another extra heavy crop the following year. As a matter of fact, there are orchards in Tasmania where all varieties appear to be in danger of becoming biennial croppers. A lack of certain plant foods may be partly responsible for this state of affairs, but it has been proved by experience that proper spur-pruning, and crop-thinning, will do a great deal to improve this condition.

There are some otherwise good apple varieties, which are well known as biennial croppers under all circumstances, and it is sometimes suggested that thinning will, in time, tend to change the habit of these, and cause them to bear annually. If this were so, all the other benefits resulting from thinning would not be of such importance as this one factor. Unfortunately most of the evidence which has been gathered fails to support this theory.

For reasons which will be mentioned later, the thinning of an apple crop should usually be done before the middle of December; and for this reason one season's thinning is not likely to influence

the formation of fruit-buds for the following year, as these will have already been formed. On the other hand, when thinning is carried on regularly its accumulative effects are considerable on annual bearing varieties, and greatly reduce the chances of light crops following heavy crops.

The breaking and splitting of branches is also a serious feature when trees are allowed to over-bear. Not only are large limbs a loss in themselves, but such breakages frequently allow fungi and other pests to gain an entry to the tree, when further limbs, and occasionally the whole tree, may be lost.

From almost every point of view the expense of thinning is justified. The trees themselves will benefit, insomuch that there will be fewer broken limbs and less devitalisation brought about by maturing excessive crops, often of inferior fruit; and in the end more regular crops will be produced.

The fruit will be up to size, and of improved colour, while the number of culls can be reduced to a minimum. The latter feature is an important one, for every orchardist and packing-shed manager knows what a great deal of extra work and expense the harvesting and packing of a badly blemished line of fruit entails.

The middle of December is the best time to commence thinning. The reason for starting so late is that a "drop," or natural thinning of most varieties usually takes place about the middle of November, but this is sometimes delayed, or goes on until December. A lookout should be kept, and when the natural process is over, artificial thinning should begin.

Some people prefer to do the work by hand, but there are several makes of shears and small secateurs procurable, and as one gets used to working with these a quicker and better job than can be done by hand is possible.

The distance to be left between fruits is a problem, and the beginner should guard against the tendency to leave too many. The best guide in this respect is to try and visualise the average size of the variety being thinned, and leave space for each fruit to attain that size without crowding on to its neighbours.

It is often asked how many apples should be left in a cluster. This, to some extent, depends on variety and on the length of stalk. Some of the successful growers of the Yates variety leave only one apple to each cluster. With most varieties, however, two may be left, unless the stalks are very short.

Another problem which comes up regularly is that of the centre apple in the cluster. With some varieties this is usually a thick or fleshy stalked specimen, which should be removed, more especially if two apples are to be left to the cluster. If the centre apple and another are left, the sizes at maturity are uneven. The apples to be left should always be selected for good shape and freedom from blemish. A little consideration of the position of the fruit left on the tree is also worth while. In thinning red varieties, as far as possible leave those that are in a favourable position for colouring. In shaded positions they will never attain their true colour. Finally, care should be exercised to destroy all grub-infested apples or pears. Every grub that escapes this year may be responsible for numerous grubs next year.

WHITE TURNIPS AS FORAGE FOR SHEEP.

Some Results of Crops Grown in the North Midlands.

By R. H. Bevin, Dip. C.A.C., B.Agr., District Agricultural Organiser.

Demonstrational plots of turnips, which were grown in the district two years ago, have been carried on since that time on a large scale with farmers, who have been growing up to 40 acres of the crop for winter feed.

The number of men growing the crop is limited, and will continue to be so until economic pressure brings about a realisation of the advantages of this winter forage crop as compared with Algerian oats alone. At the present time the stocking on our farms is not intensive, and the sheep can be wintered without a great deal of supplementary feed apart from that which the oat crops and the use of chaff self-feeders will supply.

However, men who are, by improved methods, increasing their carrying capacity to any extent, realise that the old wintering methods will not suffice for their needs. Unless some heavy-carrying-capacity crop is provided in winter, they will be faced with the alternative of either selling stock on a poor market or else carrying ewes in poor condition, with resultant losses, both before and after lambing, through low vitality and shortage of milk.

In order to avoid such a position the introduction of the soft turnip crop into our systems of farming is being advocated, and farmers who anticipate carrying more sheep—and there are few who have not room for them—are advised to try the crop on a small scale, so as to get an idea of its value.

The first experimental crops tried out were for autumn feed to cope with the January, February, March shortage, so acute in the midlands when we get a dry summer. A few of the results are given below:—

Plot.	Area	Stocking.	Period Over Which Stocked.	Actual Days of Stocking.
	Acres.	Sheep per Acre.		Days.
No. 1	6	19	Feb. 1—Mar. 30	58
No 2	4	24	Jan. 15—Mar. 20	49
No 3	3	35	Mar. 10—Apr. 23	45
No 4	6	31	Feb 6—Apr 6	55
No 5	5	30	Feb. 6—Apr. 6	60

All the crops were grown on typical soils, generally of a medium loam nature, the only point taken into consideration being the avoidance of land infested with weeds. Sowing was carried out in late September and early October.

The results given above are typical of the stock returns which we have recorded wherever possible, and the following

results from turnips sown in summer (January) for winter feeding bear out the contention that they are well worth consideration.

Last winter (1930) a paddock of 40 acres carried 25 ewes per acre for nine weeks. The area was fed off without "breaking." This winter a 35-acre paddock, divided into "breaks," averaged 29 sheep per acre from 11th May to 15th September, nearly four months.

Throughout the trials the Imperial Green Globe turnip has proved to be the best grower and keeper. The tops of this variety are markedly superior in leafage to the other varieties tried.

Points in Sowing Turnips.

For autumn feed sow in September and October. Plough early in May if possible, work to a good fine firm seed-bed, and sow 8 oz. seed per acre in 14-inch drills with 1 cwt. super. Mix seed and super. immediately before sowing, so as to avoid "burning." Sow as shallow as possible on a rolled surface, and cover with light chain or brush harrows.

For winter feed sow in January. Plough as early as possible, and fallow to conserve moisture during the summer. Prepare seed-bed and sow as for autumn turnips.

Feeding Off.

1. For Carrying, But Not Fattening.—The paddock should be fenced off temporarily into 5 to 10 acre blocks, depending on number of stock. Sheep should not be given more than 3-4 hours per day on the crop, and then run off on to rough feed or else given self feeders with chaff.

2. For Fattening.—Stock may be left on all the time (and provided with chaff self feeders), unless the weather is excessively wet and cold, when an hour or two per day is sufficient.

3. For Cows.—Where turnips are used for cows, turn the stock on to the crop immediately after milking, and turn off when they have fed for an hour or so. This prevents tainting of milk.

Not only is the turnip crop capable of carrying large numbers of stock, but it is specially valuable for raising the standard of soil fertility and as a breaking-in crop on new land.

Fertility Raising.

Where land is worked on a system of crop rotation, turnips can be introduced to follow grain. Fallowing to kill weeds is essential, and this working, combined with the heavy stocking of the crop, plays an important part in restoring fertility. For successful cash cropping, the introduction of an occasional forage crop is a necessity, and the existence of a lot of the worn-out land in the north is directly due to lack of forage crops, which, had they been sown periodically, would have checked the drain on fertility.

Breaking in New Land.

Most of our ploughable run country carries tussocks or sags, and the difficulty to be faced when breaking it in is to obtain the rapid disposal of these in order to facilitate subsequent ploughing.

Probably no crop will give such immediate results as will white turnips. This crop grows readily on new land, and the subsequent heavy stocking, especially in winter time, consolidates the soil and hastens the rotting of sags and tussocks to such an extent that the second ploughing is really quite effective in finishing off the job. In addition to this, the land will yield two or three heavy cash crops as a result of the fertilising value of the turnips, and these repay the cost of breaking up before pasture is finally sown down.

The actual seed cost of turnips is quite small, 1s. 6d. to 2s. per acre at the outside. If, for any reason, the crop should fail, the loss is not serious, as there is always a good fallow on which to grow early Algerians. The manure sown with the turnips is not lost, but is available for the Algerians.

That so many stock can be carried on turnips is a cost-reducing factor, for where 2-3 acres of Algerian oats are necessary for carrying sheep, 1 acre of turnips will suffice, thus reducing the labour of ploughing and cultivating, and at the same time liberating further land for some other branch of production.

There is no doubt that, with attention to the details of cultivation and sowing, white turnips will prove to be an efficient and economical forage crop. Because of their high carrying capacity, and suitability for low rainfall conditions, they are destined to play an important part in the development of live-stock farming throughout the State.

POTATO MANURIAL TRIALS: SEASON 1930-31.

Since the last issue of the Journal harvesting operations have been completed on all areas. In all, four trials were carried out, two on basalt soils of the North-West Coast and two on grey loam of the midlands. Full details of these trials will be published in a later issue of the Journal.

As in previous years, all evidence goes to show that phosphates up to 4 cwt. to the acre should be the basal manurial dressing for the crop. On the main crop for the north-west the addition of 1 cwt. of sulphate of ammonia has generally given further payable increases in yield. In the midlands this year increases in yield were also obtained by the addition of potash. This season we are again measuring the increases from all these manurial substances, as the effects from them vary in different seasons.

The present recommendation for manuring the main potato crop is a mixture of superphosphate 4 cwt., sulphate of ammonia 1 cwt., applied at the rate of 5 cwt. per acre in the furrow at planting time.

THE PREVENTION OF LATE OR IRISH BLIGHT OF POTATOES.

By W. J. DOWSON, Plant Pathologist, and C. E. W. OLDAKER, Agronomist.

LATE blight or Irish blight of potatoes has been with us in Tasmania for probably 30 years, although first officially recorded only in 1909. It is certain, however, that the disease had been, for some years previously, responsible for a then unidentified tuber rot in some of the higher and wetter inland districts. In 1905 this characteristic rotting came under the notice of coastal growers, and, as it gradually increased, became recognised by the name of "brown rust."

From 1906 onward a succession of seasons favourable to a spread of the disease occurred, until in 1911, a year of prolific growth, crops throughout the State were swept and blackened in a few days, resulting in unprecedented loss. For a period the seasons then became drier and brighter, particularly the season 1914-15. The result was that blight almost disappeared, and for some time occurred only in the mild and humid conditions of the far north-west, where the white-skinned variety Snowflake was largely responsible for carrying the infection.

This article is written principally with the object of drawing attention to the fact that another series of years similar to those following 1906 appears to be in progress. It is at least certain that the incidence of blight has rapidly increased during the past three seasons, and the need for disease control appears urgent.

During 1928-29 one small outbreak was noted in an eastern district of the North-West Coast during the judging of a crop competition. Deliveries at the ports of consignments carrying tuber infection were, however, negligible. Last season, 1929-30, the disease had spread to such an extent that, in many cases, the result was serious. During the current year the damage and loss may be described as disastrous. Several districts suffered over 50 per cent. reduction in marketable tubers from the early Bismarck crop, and probably throughout the season there has been a total loss from blight and "waterlogging" of the tubers through excessive moisture of approximately a quarter of a million sacks.

It is assumed, therefore, that if the forthcoming spring and summer are characterised by excessive rainfall, the losses from disease will be still more serious, unless means of prevention are adopted.

That the disease first makes its appearance in the "tops" is well known, and also that soon afterwards the roots become affected more or less badly. What is not so well known, however, is that the only infection of the tubers comes about by spores of the fungus being washed down by rain from the leaves and stalks into the soil and on to the developing tubers. The tubers are almost invariably attacked at the "eyes." It used to be

thought that the disease travelled down the stalks through the underground runners into the tubers, but this is not so. It follows, therefore, that the more the tubers can be protected from any spores washed down by the rain, the less will be the amount of infection on them. It has been proved over and over again in Great Britain, where the disease is looked upon as the worst of the forty odd troubles growers have to contend with, that adequate moulding or earthing up will practically prevent the disease reaching the tubers, even though the tops are laid low and turned black by the disease. But to mould up properly requires sufficient soil on either side of the plant, and under present Tasmanian practice the rows are too close together to permit of this.

It is suggested that a few, say 10, experimental rows be tried out in as many places as possible to test the worthiness of the English practice. It means that instead of ploughing two furrows and planting the third, as is ordinarily done, three should be ploughed and the fourth planted. This would provide more soil for moulding up. Four furrows, 7½ to 8 inches wide, are recommended in such a trial, and in this way a light double-furrow plough could be easily adjusted, and make planting quite an economic operation as far as time is concerned.

Another point deserving consideration is early moulding. The earlier the bases of the plants are covered, the more tubers are likely to be formed, provided rain and manure are sufficient. In Britain it is the practice to commence moulding when the majority of plants are about six inches high, repeating when they are half-grown and once more when fully grown. Moulding breaks and loosens the soil surface, and thus moisture conservation is also assisted.

The advantages of wider spacing and deeper moulding are that less seed is required at planting, and the resultant crop, at less cost, will be both healthier and heavier.

There is another method of preventing the attack of late blight, rather costly, but quite efficient if properly applied. This is the application of a fungicidal spray, or dust, at intervals during the period of plant development.

Bordeaux mixture (bluestone, lime, and water), on the 4-4-40 formula, as a liquid spray has probably been used and is well known in every potato-growing country of the world. Experiments have shown that a much weaker strength will prevent the blight spores from germinating, and that the disease may be controlled even by a 2-2-40 mixture.

In cases of severe infection, through a moist and "dripping" season, the first application should be fairly early, and the treatment repeated as the necessity arises.

One application to the plant will safeguard the foliage so treated for a long time, but, as new leafage is produced, it becomes necessary to spray again, especially if the weather is mild and wet. There need be no fear that any single operation is rendered valueless on account of a rain falling shortly afterwards as long as the mixture has had time to dry. This it does very rapidly, and even after a heavy fall of rain enough spray is left to prevent the spores entering the tissue of the leaves.

In fact, some authorities recommend spraying before a rainy period if possible, as it is under moist conditions that the parasite germinates and makes its entry into the plant.

Probably the most effective applications are those made just before, and after, flowering. Early in the season 70 or 80 gallons of the mixture per acre are usually sufficient, but later on, as the plants increase in size, up to 120 gallons, or more, may be necessary.

An alternative to Bordeaux is Burgundy mixture, in which washing soda is substituted for the lime, only the proportions in this case are (bluestone, soda, water) 4-5-40.

There is some difference of opinion as to the relative values of Bordeaux and Burgundy mixtures, but it has been determined by experiment that either is effective, and probably the latter is easier to employ. Information regarding preparation of both may be obtained on application to the Department.

Last year a very successful experiment was conducted at Ridgley, North-West Coast, for the control of blight on a Delaware variety potato crop, employing one, two, and three applications of " Bordodust."

Similar work was also carried out at Baden, Midlands, on Bismarcks, but in this case one, and two, dustings only were made.

The material was applied with a hand dust-gun, slung in front of the operator.

At each application uniform quantities of dust were used, being 17 lb. per acre at Ridgley and 15 lb. per acre at Baden, as against the manufacturer's recommendation for a progressive rate of 10 lb., 12 lb., and 15 lb., per acre. This worked out at 14s. 4d. and 13s. per acre per application; including cost of labour and material, but not allowing for purchase, or hire, of the machine, which is priced at £7 10s.

The test at both centres indicated good results from the dust control method. At Ridgley, however, after the second application on the experimental plots (15th December), when it appeared that loss might become serious, the grower on whose farm the work was being conducted secured a quantity of the dust, and once treated the whole crop area, outside the plots. This action checked progress, and any further infection, of the disease. At the same time, however, comparison of the experimentally dusted areas with an untreated area was prevented. At harvesting the following results were recorded:—

Area A.	Area B.	Area C.
Dusted 4.12.1930 " 15.12.1930 " 7.1.1931	Dusted 4.12.1930 " 15.12.1930	Dusted 4.12.1930
All tubers healthy	All tubers healthy	One tuber showing blight

Outside the experimental areas, on that portion of the crop once dusted by the grower after late blight had made its appear-

ance in the tops, infected tubers, though few in number, were found evenly distributed throughout the field. From this data it would appear that two applications are probably sufficient to secure a healthy crop.

At Baden the results were equally satisfactory. At the time of the second dusting very little, if any, difference was noticeable between the treated areas and the outside (check) crop. This appearance continued while all the tops were green, but as soon as a general ripening commenced, the treated plots were outstanding on account of the green, healthy foliage of the plants. The difference was still greater at the beginning of April, when a heavy frost killed all growth and prevented further comparison.

As in the case of Bordeaux mixture, the dust will adhere very strongly to the leafage, and withstands a great deal of rain, particularly if applied at early morning, late evening, or during moist weather.

It is important to remember that a first spraying, or dusting, should be made before the disease appears. As a preventive, the fungicides are more effective than when used as a control, even after slight infection has appeared. With blight threatening, a second application should be made within three weeks of the first, and a third within a similar period, if seasonal conditions appear to demand it.

Past experience in Tasmania has largely contributed to the attitude amongst growers that, taken over a term of years, spraying does not pay. If the period 1912 to 1927 only is considered, there is much to support the contention, but it must be realised that during that time seasonal conditions were generally unfavourable to the spread of the disease. The prospect for the immediate future is, however, doubtful, and it may yet prove advisable to adopt the practice.

In conclusion, growers are again urged, whether spray control measures have been employed or not, to adopt the cheap and simple expedient of deep moulding. Preparatory cultural work should be as thorough as possible, in order that a good thickness of fine soil may be packed over the tubers. Throughout our red basaltic country, cropped and stubble land (almost invariably coarsely granulated as compared with that which has been down to clover and grass for a period of years) is extremely unsafe in respect to blight infection of the tubers. This is yet another important reason in support of potato-growing only being carried out as part of a sound rotational scheme providing for the employment of lea land for this crop.

ANSWERS TO ENQUIRIES.

Question.—I have been unable to complete the reworking of a block of apple-trees. A number of them have already been cut back. How late in the season may the work of grafting be continued?

Answer.—This depends almost entirely on the condition of the scions. If you can keep these in a dormant condition, grafting may be continued until late in November.

The best method of keeping scions in good condition is by heeling them in, in a cold shady position, or by placing them in cool storage.

—*Horticultural Division.*